Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXI March 25, 1931 No. 13

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Vol. XXI CHICAGO, MARCH 25, 1931 No. 13

Postpone Hearing on Cement to April 14

TARIFF RATES UNDER SCRUTINY

On the request of Bond, Richardson & Halstead of New York, representing the domestic cement interests, the Federal Tariff Commission has postponed hearings on Roman, Portland, and other hydraulic cement or cement clinker until April 14. These hearings had been announced for March 12.

These hearings have to do with the Commission's investigation into the cost of production and conditions of competition as between domestic and foreign manufacture and other relevant facts as outlined in Section 336 of the Tariff Act of 1930.

This investigation was requested in a resolution passed by the United States Senate, June 18, 1930. Present tariff rates on these products, as carried in Paragraph 205-b of the present law are:

"Roman, Portland, and other hydraulic cement or cement clinker, 6 cents per one hundred pounds, including the weight of the container; white nonstaining Portland cement, 8 cents per one hundred pounds, including the weight of the container."

Kentucky Producer Soon to Operate New Quarry

A new quarry is about to be opened by the Central Rock Co., Lexington, Ky., on a 19-acre site adjacent to its old quarry. Stripping operations are already under way, and track extensions will be made shortly. It is planned to install a primary crusher near the new quarry floor. Two new buildings, constructed to house the company's testing laboratories, have been recently completed and are now about to be equipped. Soil tests will be carried on in one of the laboratories to facilitate and promote the sale of agstone.

To Rebuild Cement Mill at Cape Girardeau, Mo.

The Marquette Cement Manufacturing Co. of St. Louis, has awarded a contract to the Burrell Engineering & Construction Co., Chicago, for the reconstruction of most of its entire plant at Cape Girardeau, Mo. The work is to include the complete rehabilitation of the raw-grinding department, revamping of the finish-grinding mill, installation of an improved system for handling and cooling clinker, additional kilns and boilers, and improved power-generating units.

H. O. Cole is manager of the Cape Girardeau plant. Its capacity has been approximately 9,000,000 bbl. per year.

Marquette Uses Towboat in Test on Illinois River

The new towboat *William Dickinson*, with a tow of four barges, owned by the Marquette Cement Mfg. Co. and operating out of Cape Girardeau, Mo., loaded the first cargo of cement to be transported out of that district via rail-waterway transfer recently at La-Salle, Ill.

A group of Marquette company officials, including President Theodore Dickinson, Secretary-Treasurer W. A. Wecker, General Superintendent R. R. Moyle, Sr., General Sales Manager Charles Pelton, Assistant to General Manager D. W. Saxby, Assistant Secretary V. J. Hanley and Traffic Manager C. M. Tuttle arrived from Chicago to witness the transfer of the cargo from freight cars to the barges.

The cement was brought to LaSalle over the Burlington railroad from the Oglesby, Ill., plant and temporary pumping equipment made quick work of the transfer to the barges.

The Marquette company has announced that thorough experiments will be made of the new plan and in the event that it is proved practicable, the system may become permanent.

Alabama Lime Operator Is Increasing Capacity

The Keystone Lime Works, Inc., Keystone, Ala., is installing a new crusher to increase the capacity of the plant to 1,000 barrels of lime daily and to maintain that production in order to meet the normal demand for lime in that section.

In addition to the crusher, the company is installing an elevator, storage bins and a hoist. The plant is located on the Louisville & Nashville Railroad and production includes high-calcium lime for the building and chemical trades. William V. Hammond is president, M. W. Hammond, vice-president, and B. F. Grubbs, chief engineer.

Aggregates Firms in Central South Merge

SIX PRODUCERS POOL HOLDINGS

The merger of five sand, gravel and stone companies into a corporation with resources of $5,000,000 was announced at Memphis, Tenn., recently by the heads of the new firm, known as the General Aggregates Corp.

General offices have been established at Memphis. A. J. Hoffman, Louisville, Ky., of the Kentucky Consolidated Stone Co., heads the corporation. W. W. Fischer, of Memphis, is chairman of the board.

The merged companies are the Central Sand & Gravel Co., Memphis, the Greenville Sand & Gravel Co., Greenville, Miss.; the Ohio River Sand & Gravel Co., Paducah, Ky.; the Cedar Bluff Quarry, Princeton, Ky.; the Cerulean Stone Co., Cerulean, Ky., and the Camden Sand & Gravel Co., Camden, Tenn.

The corporation announcement declared that the member companies affected dominate the production—in the central South—of crushed stone, sand, gravel, riprap and limestone used in construction of highways, railway rights-of-way and other building.

Improved facilities and "important operating economies" led to the merger, the announcement by Mr. Hoffman said. The new firm is incorporated under the laws of Delaware.

Wisconsin Producer to Build New Gravel Plant

The Eau Claire Sand & Gravel Co., Eau Claire, Wis., has completed plans for the construction of a new sand and gravel plant. Work will begin soon, according to officials, and, when completed, the new plant will have a capacity of 50 cars daily. A. Owen Ayres is president and general manager of the concern.

Gravel Producer Forms New Operating Company

Formation of the Port Byron Sand & Gravel Co., to operate a pit and plant on Illinois State Highway No. 80 north of Port Byron, Ill., has been announced by F. O. Plym, president and manager of the concern.

Bins are now being installed at the plant site.

Reports on Oregon's Non-Metallic Minerals

ASBESTOS DEPOSITS REVEALED

A progress report just released includes some results of the coöperative survey of the mineral resources of Oregon that was conducted, during the open seasons of 1929 and 1930, by the U. S. Geological Survey and the Oregon State Mining Board. Few of the ordinary non-metallic minerals of commerce were found or discussed, but the report says:

"A sample of asbestos reported to have been obtained from a deposit on Baldy Mountain, in the southwestern part of Baker County, is of such quality that a thorough field examination of the deposit is justified. A further attempt should be made to verify the rumor of an extensive deposit of asbestos in Wallowa County.

"It is recommended that a further search be made for deposits of silica sand suitable for the manufacture of glass.

"It is suggested that a study be made of the several alkali lakes of southeastern Oregon to determine the tonnage of chemical salts, of which sodium sulphate, a prominent constituent, is an essential chemical in the pulp industry of the State.

"Basalt, tuff, granite, and limestone (including marble) suitable for building and road construction have been developed in some localities but are present in many other places in eastern Oregon. The importance of sand and gravel has been enhanced by the rapid increase in concrete construction and warrants a more thorough study of these resources.

"Vast quantities of pumice and volcanic ash of different degrees of fineness occur in eastern Oregon, particularly in the valleys of the Deschutes, Klamath, and Umatilla Rivers.

"Owing to the fact that limestone is generally scarce elsewhere on the Pacific coast the deposits of southwestern Oregon are of special interest. The more easily accessible deposits should be mapped in detail as a guide to their future use.

"The annual output of clay-working industries in western Oregon amounts to about $750,000, and every year sand, gravel, building stone, and crushed rock worth $2,500,000 or more are produced. Pumice is abundant in places and is used by one company in the manufacture of cement. The distribution and geologic occurrence of these raw materials are worth investigation."

Construction of Clark Memorial to Aid Sales

Appropriations for the George Rogers Clark Memorial at Vincennes, Ind., by the Federal government will help swell the aggregate production for several Knox County producers. This project, which consists of a memorial building overlooking the Wabash River, a 2,900-ft. sea wall and a new Wabash River bridge, will do much to beautify the water front of this city. The sea wall has been completed and the memorial building will be started as soon as a pending federal appropriation is approved. Over 50,000 cu. yd. of aggregates will be required for the building and 20,000 cu. yd. for the bridge. It is anticipated that ready-mixed concrete will be used in the construction of the building.

Total construction work for Knox County, including the addition to the Vincennes, Ind., post office and county highway work, will approach $3,000,000.

Louisiana Gravel Plant in Operation by Apr. 1

Gifford-Hill & Co., Dallas, Tex., will begin production about April 1 at its new sand-and-gravel plant located at Searcy, La., according to J. H. Wilson, superintendent. The new plant will employ about 50 men at the start. Most of the material produced will be used in road building, the state of Louisiana having an extensive program of construction planned for the current year.

Builds New Ready-Mixed Plant; Ready by Apr. 15

The Certified Concrete Co., a new concern, was recently incorporated by Sidney L. Fuller of Wauwatosa, Wis., to produce and sell ready-mixed concrete. Construction of the plant is under way and company officials expect to start production about April 15. A 2-cu. yd. mixer is being installed.

American Silica Corp. Buys Ottawa Competitor

The American Silica Corp., of Ottawa, Ill., recently purchased the property of the Ottawa Sand Corp., Ottawa, Ill., according to A. S. Hindman, Chicago, vice-president. With the acquisition, the concern changed its name to the American Silica-Sand Co.

Lets Contract to Sink Shaft at Salt Deposit

The Louisiana Development Co., of Winnfield, La., recently awarded a contract to the Dravo Contracting Co., Neville Island, Pittsburgh, Pa., for the sinking of a shaft to a rock-salt deposit owned by the company. Allen & Garcia Co., Chicago, are engineers in charge of construction.

Silica Crushing Plant Suffers $30,000 Blaze

The Highland Sand Co., Reading, Pa., had a $30,000 fire recently which destroyed its silica-rock crushing plant and storage bins, according to William Fisher, president.

Oklahoma, Texas Ask State Cement Plants

LEGISLATORS URGE ERECTION

Following in the footsteps of legislators in Indiana and Arizona, two other states—Oklahoma and Texas—are urging the construction of convict-labor-operated cement plants.

Signed by 68 members of the house of representatives as authors, the Oklahoma bill was introduced in the lower house of the state's legislature last week, asking an appropriation of $500,000 for the project. According to the measure the location would be designated by the state board of affairs and the work done with prison labor as far as possible. The bill provides that the plant sell cement to the state highway department and to other subdivisions of the Oklahoma government.

Construction by the state of Texas of a cement plant to cost $500,000 is provided in a bill which has just been introduced in the legislature by Representative J. L. Goodman of Franklin, Tex. The proposed plant would be operated under the direction of the state prison commission and convict labor would be employed. Location would be left to a commission to be appointed for the purpose. The bill provides that the product of the plant be used in the construction of highways, and that it shall be sold at a price which will net the state a profit of not more than 3 per cent.

Waukesha Lime and Stone Moves Milwaukee Office

The Waukesha Lime & Stone Co. announces that its offices in Milwaukee will be moved on April 1 from the Plankinton Bldg., to the Empire Bldg., 710 North Plankinton Ave.

Fire Causes Damage at Michigan Gravel Plant

Fire caused damage which exceeded $25,000 at the plant of the Standard Gravel Co. near New Hudson, Mich., early this month. The cause of the conflagration, which occurred at night, has not been determined. The blaze was largely confined to the building housing the motors which drove most of the plant equipment. Three 75-hp., one 50-hp. and several smaller motors were destroyed, together with a considerable quantity of tools, belting and wire rope.

Canada Cement to Begin Plant Erection in May

Canada Cement Co., Ltd., Port Colborne, Ont., will start work next May on its new plant at Port Colborne, Ont., to cost $500,000. The present buildings now used at the plant will be razed on completion of new works. Contract for the equipment has been awarded to the F. L. Smidth Co.

New Directors Named in Mexican Combine

CAPITALIZED AT 4,400,000 PESOS

A brief news item in the last issue of PIT AND QUARRY announced the recent merger of the Cementos Monterrey, S. A., and the Cementos Hidalgo, S. A. into a new cement corporation known as Cementos Mexicanos, S. A., with a capitalization of 4,400,000 pesos. Plants of both the original companies will continue to operate under their former respective superintendents, according to further information.

The directors of the new corporation are: Juan F. Brittingham, honorary president; Lorenzo H. Zambrano, executive president; Mariano Hernandez, vice-president; Matias Elizondo, secretary; Adolfo Zambrano, treasurer; Rodolfo J. Garcia, Rodolfo M. Garza, F. F. Niggli, Jose Zambrano Gutierrez, Antonio Muguerza, Victor de Lachia, Lic. Jose Zurita, Lic. Elias Villarreal, and Ing. Jose Munoz.

Cementos Monterrey was founded in 1920 and began operation in 1922. A year ago its capitalization was fixed at 2,200,000 pesos. Cementos Hidalgo was founded in 1903 and its capitalization was recently established at 2,200,000 pesos for the purpose of merging. The general offices of the new company will be at the offices of the former Cementos Monterrey, while a subsidiary office will be maintained at the Hidalgo plant. Warehouses will be maintained at both plants as heretofore.

Most of the company's product goes to northeastern Mexico points for consumption in highway construction.

Molding-Sand Producer Constructing New Plant

The Jones Manufacturing Co., producers and marketers of molding sand at Wooster, O., is erecting a new plant at a recently-acquired deposit near Killbuck, O.

Contract for the construction of the main plant building, to be 26-ft. by 50-ft. in size, to house the screening and crushing units, has been awarded to A. H. Uhl of Killbuck. Steam shovels will be employed for excavating.

Roofing-Slate Division to Meet at Louisville

A roofing and sheet-metal-industries conference and exhibit is to be held in Louisville, Ky., the week of January 25, 1932. For the first time also, the annual conventions of the National Sheet Metal Contractors' Assn., the Roofing Contractors' Division of the National Slate Assn., and the United Roofing Contractors' Assn. will be held within the same week, at the same place. This is the outcome of conferences for several years of committees of all three organizations. Warner S. Hays, secretary of the National Slate Assn., Philadelphia, Pa., is chairman of the committee; J. Boyd Griffiths, president of the United Roofing Contractors' Assn., is vice-chairman; and W. S. Markle, secretary of the National Sheet Metal Contractors' Assn., is secretary-treasurer.

Manufacturers, distributors and roofing contractors have heretofore spent much time and money attending two or all three separate meetings. There will be general sessions and social features of interest to all in these industries. An exhibit will be staged in the products and improved methods of application. This is another example of closer coördination of association activities, to bring cost of membership and convention travel to a minimum and to make attendance at meetings more worth while.

Adds Hammermill Unit to Make Agricultural Stone

The Newton County Stone Co. of Kentland, Ind., has purchased and will install immediately new pulverizing equipment especially adapted for the manufacture of agricultural limestone. A new hammermill is the main unit being installed.

Officials of the company announce that one of the first orders received this year calls for the delivery of 1,000 tons of limestone to the Green Acres Farms in North Newton county.

Officers of the Newton County Stone Co. include George H. Hart, general manager; C. O. Riggs, superintendent; and Russell D. Virgin, secretary.

Indiana Gravel Concern Fights Increase in Rates

The South Bend Sand & Gravel Corp., a recent consolidation of producing companies in South Bend and Mishawaka, Ind., has filed suit in the United States district court to prevent the South Shore electric railway from putting into effect a new schedule of tariffs on sand and gravel between South Bend and Michigan City, Ind., and intermediate points.

The plaintiff objects to an increase of from 10 to 20 cents a ton on sand and gravel, and sets up the contention that it will be damaged $3,000 a year if the increase is permitted to go through.

Proceed with Rebuilding Birmingham Slag Plant

According to information received from G. C. McCullough, general manager, Birmingham Slag Co., the reconstruction of this company's screening plant at Ensley, Ala., which was destroyed by fire several months ago, is proceeding nicely. The steel framing has been erected, new screens have been installed, and operations should be resumed before the end of this month.

Six Companies, Inc. Gets Hoover Dam Job

SUBMITS LOW BID OF $48,890,999

"Six Companies, Incorporated" made a low bid of $48,890,999 for construction of the Hoover (Boulder) dam and has been awarded the contract, according to an announcement by the Department of the Interior, Washington, D. C.

The six construction companies which merged to make their low offer on the giant power project were: Utah Construction Co., Henry J. Kaiser and W. A. Bechtel, McDonald & Kahn, the Morrison-Knutson Co., J. F. Shea Co., and the Pacific Bridge Co.

Other bidders were: Arundel-Atkinson Co., of Baltimore and Los Angeles, $53,893,878; Woods Bros., Lincoln, Neb., $58,653,107.

Three other bids were received, but were not considered because of their "irregular" nature.

Loses Suit Over Carbon Dioxide as Refrigerant

American Patents Development Corp. and Dry Ice Corp. of America have lost their suit in the United States Supreme Court against Carbice Corp. of America for alleged infringement of a patent covering the manufacture of solidified carbon dioxide, or "dry ice," as a refrigerant.

American Patents Development Corp. had a patent on a method of refrigerating foodstuffs by means of solid carbon dioxide. The licensee of the patents, the Dry Ice Corp. of America, sells solidified carbon dioxide to be used with this method, on the condition that the buyer use the carbon dioxide manufactured by the Dry Ice Corp.

The Carbice Corp. sold its solidified carbon dioxide to a user of the patent and suit was instituted by the development corporation for infringement of its patent.

Justice Brandeis, in announcing the decision of the court, said that to sustain the complainants' contention, would be to limit the use to which the patent could be put, which, he said, could not be done.

Carney Markets New and Improved Brick Cement

The Carney Cement Co., producers of masons' cement, has announced the development of an improved product which is said to control efflorescence and is almost entirely waterproof. The mortar is free from soluble salts and is said to assist also in preventing efflorescence in the building units themselves. Water repellency has been gained through the admixture of a calcium-stearate waterproofing compound to the extremely fine and dense cement.

Editorials

Railway Opposition to the Development of Highways

THE campaign against the continuing development of highway traffic has gained new strength during the period of slackened business through which industry has been passing. The financial difficulties of the railroads and the inability of their operators to find new revenue for that alienated by motor traffic have served to spur on to fresh attacks those who feel that the railroads' security is imperiled by the rapid advances in motor transport. Ever since the effects of motor traffic began to be felt the railroads have been ardent—and, it must be said, not always fair—opponents of highway-traffic development. But as the years have passed their opposition has increased in scope, in bitterness, and in effectiveness, until every useful agency —advertising, publicity, the editorial voices of the daily and financial press—has been enlisted in the fight to stem the tide of increasing motor competition and to try to safeguard the financial security of railroad investments by the restriction of highway traffic.

To most producers of non-metallic minerals the conflict has appeared to be a matter of remote concern, a contest in which they had, perhaps, a natural curiosity but no material interest. Favored with a constantly increasing business during the years of prosperity, they saw no occasion to be alarmed at a situation which, in spite of its growing seriousness, seemed too far off to warrant watchful study.

The growth of highway transport is essential to the continued expansion and future security of the industry that produces road-building materials, and producers can not afford either to ignore the propaganda which aims to curtail road traffic or to underestimate its effects. Any restrictions placed on the free use of the public highways must have the effect of checking the demand and the need for further highway development and of limiting, to precisely that extent, the amount of road material required for new construction. And as highway traffic diminished, the need for material used for maintaining existing roadways could be expected to decline proportionately.

The importance of these facts may have been obscured to some extent by the prosperous business of recent years, but the sharply reduced demand of the last year and a half has given them a new significance. In times such as these producers have been looking not alone at the opportunities and the difficulties of the moment but at those of the future, even the distant future. In any such long-time view, highway traffic and its possible condition under the growing opposition of competitive forms of transport are bound to receive more earnest consideration.

In their pleas for public sympathy the railroads have always made much of the alleged unfairness of a situation which forces them to build and maintain their own rights-of-way, while motor traffic, which provides a very persistent and effective competition, enjoys the use of highways built and maintained by public funds. They have never thought it necessary to point out, however, that the facilities for which they have paid are their exclusive property, under their control, and closed to competitive traffic. Neither have they mentioned the fact that the highways are still public highways, under public control, and open to all kinds of competitive traffic, including that created by the railways themselves through the operation of railway-owned motor-bus and motor-truck lines. Nor have they offered any explanation of their failure to inaugurate public motor-carrier service at a time when they might have secured virtually a monopoly control of it through their superior means and superior organizing and administrative ability, before individual enterprise, poorly financed and poorly equipped, assumed the risks of pioneering. Now that motor traffic has been developed to profitable proportions and to the point where it offers dangerous competition, the railroads ask for a form of motor-traffic control that will take the profit out of motor transport and make railroad transport the only available form, even for traffic to the handling of which it is economically unsuited.

For years the railroads have bemoaned the high cost to them of less-than-carload freight, and they have made the high cost of l. c. l. service the excuse for their repeated demands for high rates on carload traffic. They have likewise painted a harrowing picture of the profitless handling of passenger traffic and have used the argument for the same purpose and with equal effect. Yet, now that motor trucks have relieved them of burdensome l. c. l. freight and now that privately-owned motor-cars have taken much of the passenger traffic which proved so onerous, they claim to be in an even worse condition than when these unprofitable forms of business were exclusively theirs.

Testifying before the Interstate Commerce Commission, Alfred P. Thom, general counsel of the Association of Railway Executives, complains bitterly

of the competition offered to the railroads by common-carrier motor-vehicles using the public highways. He maintains that no co-ordination of highway and railway transport can be effected as long as the government allows motor-carriers to indulge in rebates and to make what he describes as unjust discriminations in rates, service, and methods. He asserts that "there is a serious wrong to the railroads in allowing their competitors to take away their traffic by underbidding their known and published rates and by offering special discriminatory advantages to shippers. The railroads do not ask that motor competition be removed or destroyed. All they ask, and this the interests of the public imperatively demand if the adequacy and efficiency of rail transportation are to be preserved, is that the terms of competition be equal and fair."

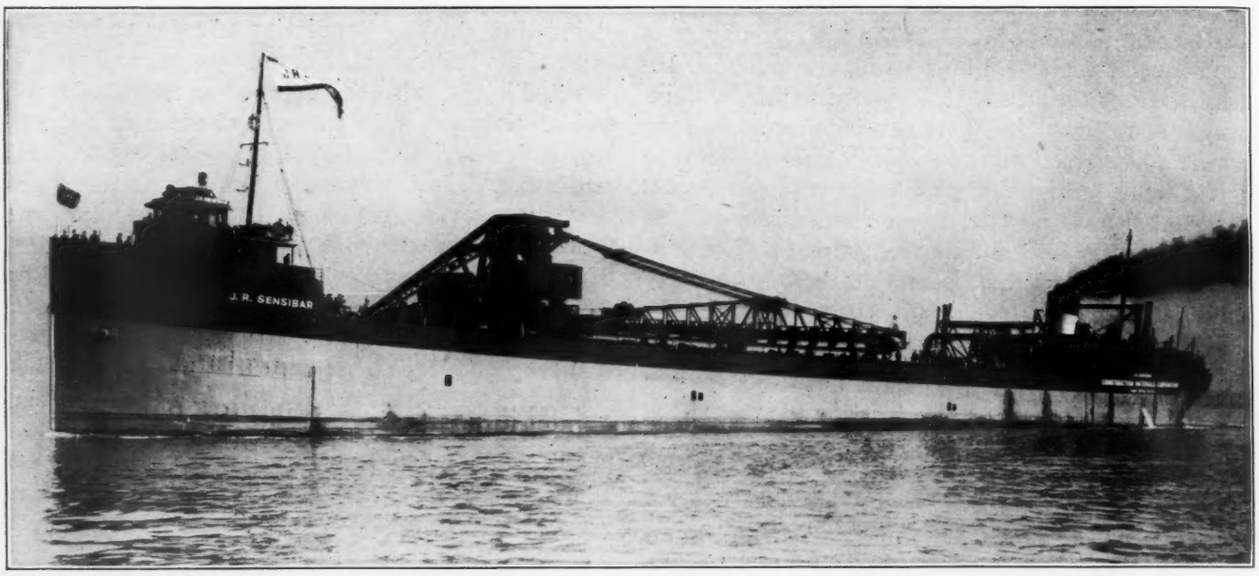
What the railroads either overlook or purposely ignore is the fact that commerce has the right to utilize the cheapest and most efficient form of transport available, and that the two forms of transport under consideration are not competitors in the strict sense of the term since they do not offer comparable services. If the motor-truck and the motor-bus render a cheaper or a more efficient service than the railroads, the remedy seems to lie either in an abandonment by the railroads of a class of service which they are not able to handle efficiently or in the improvement of their equipment and methods so that they can handle it efficiently. The railroads can not reasonably expect that commerce shall knowingly penalize itself, either by paying a higher price for equivalent service or by foregoing the advantages (other than financial) which are peculiar to motor service, just for the purpose of safeguarding the investments of railroad owners.

The federal regulation of motor-carrier rates, aside from all question of the justice of the proposal, will not accomplish what the railroads seek except in those cases wherein the motor rates are lower than those of the railways, and this is not usually the case. While the railroads provide only a terminal-to-terminal service, the motor truck gives door-to-door delivery, so, for this reason if for no other, the motor carrier is not forced to underbid the railroad in order to get the business. He offers speed, reduced damage in transit, freedom from the necessity for crating in many cases, and fewer errors in delivery due to the elimination of unnecessary handlings, and these are advantages that, in normal times, are worth much to every shipper.

In asking that the highway carrier be regulated as are the railroads, the latter are demanding that the most efficient and economical means of performing certain transportation tasks should be held down to the level of operating efficiency set by the railroads, which, in the present state of transportation knowledge, are not the most efficient means of doing those tasks. Regulation of rates as between one railroad and another may be proper and may be effected in the railroads' interest as much as in the public's interest. The same may be true as between one motor carrier and another. Each set of competitors, within the range of their own field of operations, provide real competition for one another. They use like means and they render a like service. The advantage one has over his competitor arises from superior administrative skill and not from superior mechanical or engineering knowledge. It may be practical to regulate the competition between two practicers of a single art, but not between the practicers of different arts.

Motor traffic is paying a large share of the cost of building and maintaining the highways which it uses, and much of the money which it contributes through license fees and gasoline taxes finds its way into other forms of public improvement which are unrelated to highway transport. And in return for its contribution is received merely the right to use, an easement, not a monopoly. Motor-vehicle license fees and taxes are already immoderately high in view of this fact. In some states the owner of a 3-ton motor-truck pays more than $1,100 yearly for the privilege of using the highways of his own state, and, if his work carries him into other states, he may pay as much as this or more for the privilege of using but a small part of their highway systems. In other states motor carriers are taxed on the basis of their gross annual receipts or earnings, the percentage ranging up to 6 and being augmented, in one state, by a 5 per cent tax on gasoline. Motor trucks, which represent not more than 12 per cent of the country's motor vehicles, pay nearly 30 per cent of all vehicle taxes.

The railroads are determined to discourage the use of the public highways for all forms of traffic which they feel able to handle themselves, whether inefficiently or not, and their work in this direction is evident in every state where high motor-truck taxes are in effect. To insure the security of their old-time hold on the transportation work of the country, they would, if necessary, drive the motor truck from the highway. In this determination and in this need—both the result of a policy of expediency—lies the danger of the railroads as opponents of the road-building industry. Prohibited, or even only restricted, motor traffic means a greatly lessened demand for public highways and, in turn, a greatly lessened demand for road-building materials. The sympathy of the industry's associations and the weight of their publicity and financial support belong on the motor-traffic side of the railway-highway controversy, if the interests of the road-material producer are to be conserved.



The turbine-motor ship "J. R. Sensibar," said to be the largest and fastest self-unloading sand dredge afloat.

Huge Self-Unloading Dredge Goes Into Service on the Great Lakes

Unloads with Boom Conveyor of New Design; Is Equipped to Pump Dry Cargo Four Miles

By MAT F. BEISBER

HIGH above a busy street in Chicago, a hand passed over a grid-glow tube and, instantly, a giant electrically-driven vessel left the port of Lorain, O., majestically starting on its maiden voyage. Not a hand touched the controls of this great vessel as its giant propeller began to turn, a complete remote-control system with that wonder of the age, the grid-glow tube, making this seeming miracle possible.

Much could be said about this marvelous remote-control system. It is one of the few in existence, and was designed by the Westinghouse Electric & Mfg. Co. The present story, however, lies in the vessel, the *J. R. Sensibar*, and in the man whose name it bears.

The *J. R. Sensibar* is a self-loading and self-unloading hopper dredge, the largest of its type ever built, with a steam-turbine electric drive. It is equipped with the J. R. Sensibar method of loading and unloading cargo the method and details of which are patented or upon which patents have been applied for. Not only does it unload its material wet, but it can unload it dry and do it with a facility heretofore unknown. From every point of view, this vessel represents the apex of marine and materials-handling engineering.

A story of this triumph of the construction-materials industry would not be complete without a story of J. R. Sensibar, president of the Construction Materials Co., Chicago, Ill., its owner. No more fascinating stories have ever been published than those of the rise of our successful men and J. R. Sensibar's is no less interesting.

Some twenty-five years ago he began in the sand business, hauling sand from the site which is now the city of Gary, Ind. Horses and wagons were then the order of the day. Fire—the same agent of destruction which has ruined many a business—ruined this one too. When it emerged, it was without the horses and wagons. The necessity of supplying Chicago customers with sand caused Mr. Sensibar to open a new pit alongside a railroad. Cars were loaded by hand. Soon this method was superseded by a steam shovel and this, in turn, by a locomotive crane. Incidental to the use of the locomotive crane, Mr. Sensibar's suggestions during the early days of this machine resulted in considerable improvement in its design, especially toward increased stability.

"All this time I had been operating on a $7,000 line of credit at a bank, borrowing mainly to prepay freight," Mr. Sensibar said in an article published in *The Magazine of Business*. "We had a low flat rate per car on sand in those days, but it had to be paid in advance. Time after time, both when I borrowed and when I paid off notes, it was forced on my attention that I was doing little else but working for the railroad. They got most of the money I took in. Their job admittedly was transportation; mine, so I had thought, was sand. Gradually, though, it dawned on me that mine was transportation, too."

Thoughts along this line led Mr. Sensibar to conclude that business is much like a bottle. Under

normal conditions, a bottle has a roomy neck, but sometimes the neck of a business bottle is so long and slender that a good share of all the time, energy, and money of those in the enterprise must be spent in forcing business through it. "When that is true, the real business, instead of being what letterheads and catalogues say it is, is getting through that bottle neck. So it is with the sand business. The bottle neck is transportation." And every aggregate producer in the country will agree to that.

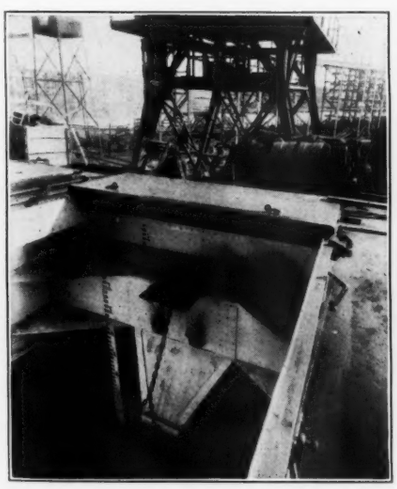
For the solution of the problem, Mr. Sensibar turned to boats, and thenceforth he has been engaged in the transportation business—not the sand business, sand being only incidental. Boats were not new in the transportation of sand, but their methods of loading and unloading were inefficient at that time. Both the crew and the power plant of the boat were idle while loading and unloading were going on, while cranes of only a few horsepower did the work. This waste of power and time suggested to Mr. Sensibar the query, why not devise a way to employ the ship's own engines, manned by the ship's own crew in loading and unloading sand? That would be real efficiency, much like requiring a locomotive with its engineer and fireman to do the work of loading and unloading freight as well as pulling the train.

In 1914, an emergency arose which forced the Construction Materials Co. to adopt this idea. In the building of the Field Museum on Chicago's lakefront, it was necessary to provide 11 acres of fill 40 ft. deep. The building was placed on stilts to place it in prominent view from Michigan Ave. Mr. Sensibar took the contract at a very low figure with the provision that he would be allowed to work some of his own ideas in the methods of moving the sand. The idea of pumping sand into the fill was promptly rejected by the architect, so the sand was at first pumped into bins, and then, by means of a conveyor system, it was moved to the site. After approximately 6,300 tons were moved this way—less than 3 per cent of the total required—a crisis occurred, one row of columns having already moved in places as much as 6½ in. Further investigation found that the unequal settling of the 6,300 tons of sand into the soft fill underneath had forced the row of columns out of plumb to one side from the toe of the sand. In sheer desperation, the architect and other authorities gave permission to Mr. Sensibar's company to pump the sand into the remainder of the fill. This was done, the sand being spread evenly over the site, a few inches at a time—the idea worked.

Thus the foundation of an industry was laid. Soon other sites were filled in the same manner. The entire plant of the Great Lakes Steel Corp. at Ecorse, Mich., rests on a site of 200 acres, entirely filled by this method. Material brought 50 miles was used to make a fill averaging 12 ft. in depth over an area of 40 acres for the Newton Steel Co. at Monroe, Mich. Other large industries taking advantage of this method were the Youngstown Sheet & Tube Co., Indiana Harbor, Ind.; the Continental Motors Co., Muskegon, Mich.; and the Johns-Manville Co., Waukegan, Ill. One of the largest projects of its kind was the lakefront development for the South Park Commission of Chicago. Here over 600 acres were filled to depths varying from 5 ft. to 57 ft., including many hills and slopes up to 43 ft. above the lake level. The coming World's Fair in 1933 will rest entirely on land filled by the pumped-sand method.

With the increased use for this method, improvements in the equipment naturally evolved. New boats were constructed and, at present, the Construction Materials Co. owns five. The *Sandmaster* represents an investment well over $1,000,000.

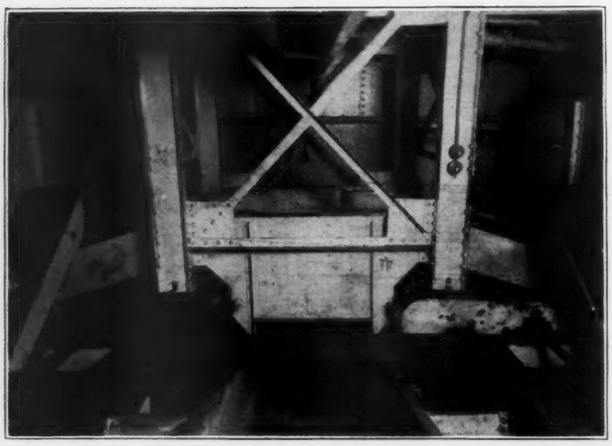
Of this fleet, the *J. R. Sensibar* is the largest and finest. It is by far the largest hopper dredge on the Great Lakes and, as far as known, in the world. Some of its principal dimensions include a 553-ft. overall-length, a 56-ft. molded beam and a 31-ft. molded depth. The hoppers have a cubical capacity of 10,000 cu. yd. and a carrying capacity of 10,000 tons. So many of its features are unique that a comparison with other vessels of the same type is impossible. In fact, patents have been secured on



One of the spouts sending material into the hoppers.

Main control board in engine room of the "J. R. Sensibar."

One of the jets used to wet down the cargo in wet unloading.



Cross conveyors feeding incline conveyor leading to boom.

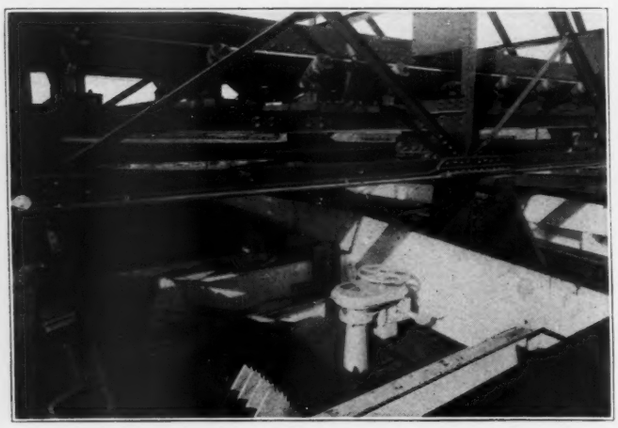
much of its equipment and other patents are pending.

Recently, the Museum of Science and Industry of Chicago, Ill., now in the course of preparation and construction under the Julius Rosenwald foundation, invited the Construction Materials Co. to include among the exhibits a model of the *J. R. Sensibar* as representative of the latest and most modern vessels of its type. This compliment truly attests this engineering triumph.

Steam-turbine electric drive, pulverized-coal-fired boilers, pilot-house control, a streamline rudder, and a cutless-rubber-type stern bearing are some of the salient features of this modern carrier.

Its materials-handling ability can be appreciated from the fact that it can load and unload its cargo in five different ways: load and unload dry materials, load dry and unload wet materials, load wet and unload dry materials, load wet and unload wet materials, and pump wet material from ship's position and discharge to a point 4 miles distant.

Such a wide facility has been heretofore unknown, and it will double the vessel's value to the owners through its additional utility. On its maiden voyage, the *J. R. Sensibar* carried a cargo of coal to Green Bay, Wis. Thence it proceeded to Sturgeon Bay, where a cargo of stone was picked up for Chicago.



Looking into one of the hatches showing valve and gate-control for wet cargo.

With a maximum unloading rate of 4,500 tons of bulk cargo per hour, either wet or dry, the *J. R. Sensibar* is claimed to be the fastest bulk-unloading plant either afloat or ashore. The boom conveyor, by means of its patented A-frame, can swing through an arc of 145 deg. from the ship's center-line, or a total of 290 deg. from side to side. In other words, this vessel can unload to a point on the dock opposite the ship's bow. Other vessels with unloader boom conveyors are able to swing them through an arc of only 95 deg. from their center-lines, or through a total arc of 190 deg. Obviously, this feature is a great advantage, permitting a wide range of unloading without movement of the vessel. In fact, the *J. R. Sensibar* is in a position to take certain contracts at a premium because of its ability to unload at docks which have but a limited space for the movement of the ship.

Construction view of hold, hoppers in background. Note tank-top depression for conveyors.

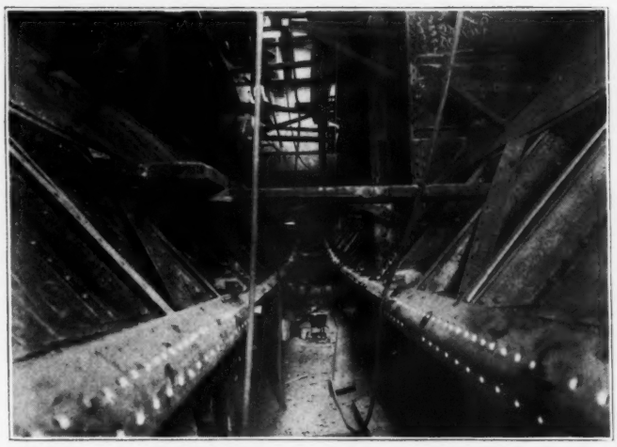
Construction of this modern hopper dredge began in January, 1930, at the yards of the American Shipbuilding Corp., Lorain, O. Originally, the *J. R. Sensibar* was a bulk freighter, the *Frank C. Ball.* It was purchased outright, and the hull was stripped of practically all its machinery. Nearly $2,000,000 was then expended by the Construction Materials Co. to convert and rebuild the hull and to equip it with its present machinery. Upon its completion in November, 1930, the boat became the largest sand-sucker hopper-dredge, as well as the fastest wet or dry cargo-unloading vessel ever built in this country.

J. R. Sensibar, president of the Construction Materials Co., was responsible for the initiation and design of the major features. H. N. Herriman, vice-president of the American Bureau of Shipping, acted as naval architect. Chas. R. Fisher, formerly chief engineer of the Bradley Transportation Co., acted as consulting engineer and was responsible for many of the vessel's unique electrical features. The entire materials-handling equipment, including all conveyors, the A-frame, the boom, and other special features were built from the designs of Chas. M. Rudow, consulting engineer, Chicago, Ill. With

the forces of the American Shipbuilding Corp. were A. W. Cross, naval architect; J. C. Workman, chief engineer; and John Steinman, general superintendent. R. A. Brinkman, marine superintendent for the owning company, was in general charge of the work.

The plan of the ship shows it to be divided into five sections, separated by water-tight bulkheads. Beginning with the bow, these sections are the forepeak, the forward conveyor-equipment space, the cargo hold, the machinery space and, finally, the fan-tail which is the stern end of the ship. The cargo hold is, of course, the largest section of the ship. It consists, roughly, of two parallel hoppers running the full length of the cargo hold. They are separated longitudinally by a center water-tight bulkhead, and transversely by two screen bulkheads, producing six compartments.

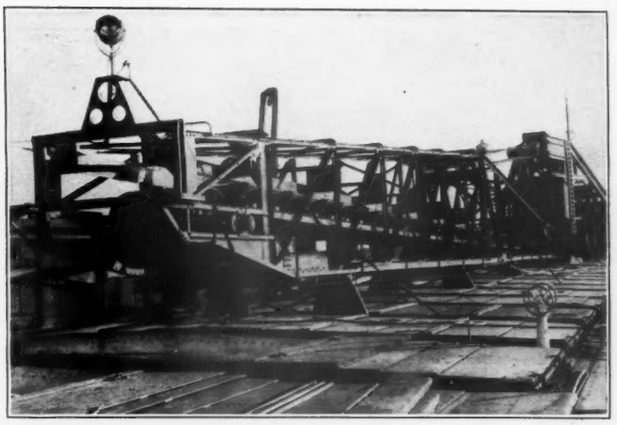
The hoppers are built up from the sides and the tank-bottom of the ship and consist of heavy steel plates riveted together and supported by structural-iron shapes. Each hopper has a flat bottom consisting of a series of continuous gates for its full



Construction view of one of the hoppers. Projection of well shown at upper right. Continuous gate opening in center.

length. Beneath these gates, each of which is 3 ft. wide and 3 ft. 10 in. long, is a 48-in. belt conveyor to transport the dry materials to the forward conveyor compartment of the ship. In order to accommodate the belt-conveyor beds beneath the hoppers, and to lower the center of gravity of the cargo, the tank top was depressed 30 in. This feature was originally conceived and patented by Mr. Sensibar, worked out by the owners' engineers and was approved by the insurance authorities several years ago in previous designs.

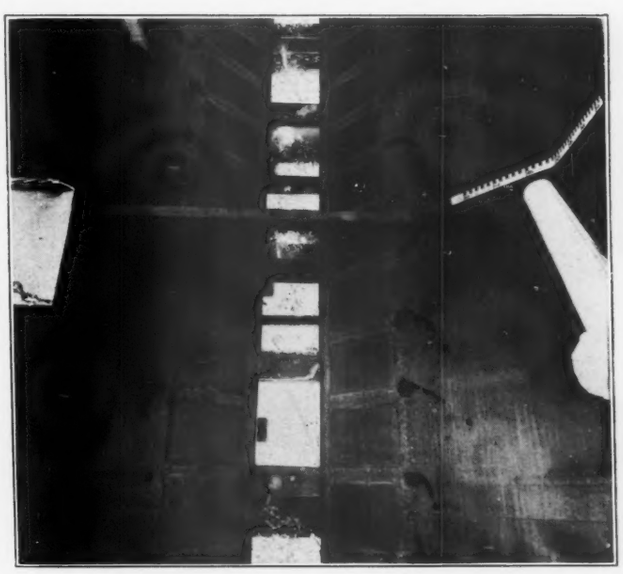
As both wet and dry materials are handled by the *J. R. Sensibar*, it was necessary to have the entire series of gates water-tight, yet providing a free opening to unload the dry cargo onto the conveyor belt below. This problem was solved by providing each gate with a rubber gasket and wedge-and-screw mechanism which forces the gate tightly against the gasket. Each gate has its own wedge mechanism and is operated by a small hand crank.



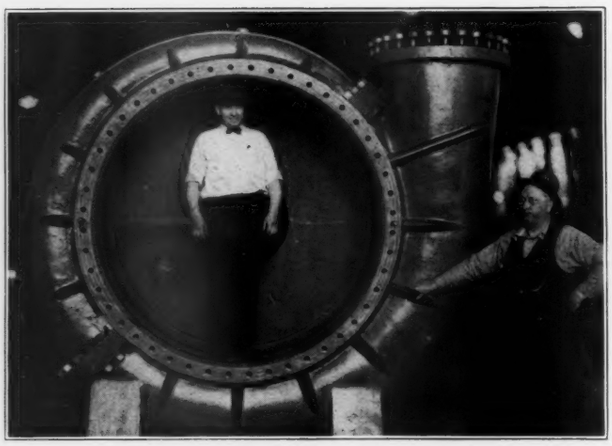
The long boom conveyor can unload to a point 140 ft. from the vessel's side and 80-ft. high.

The horizontal movement of the gates is not accomplished by hand, however. Each gate has a rack-and-pinion horizontal movement, the pinion shaft extending outward, terminating in a double-ratchet-and-dog mechanism. Through a series of reciprocating arms which extend the full length of the hopper, power can be applied to any desired gate by inserting a dog on the ratchet. By inserting the opposite dog, the gate will be propelled to the closed position. It is then but a simple hand operation to draw up the wedge under each gate to make the hopper water-tight. The reciprocating-link mechanism which supplies power to the gate ratchets was built by the Huron Industries, Inc., Alpena, Mich., and is driven by means of a 20-hp. motor.

Another outstanding feature of the hopper design is the provision made for relieving the cargo of excess water and moisture from a wet cargo. The sand and water mixture from the two sand pumps aboard is discharged into a long flume below the hatches, where it is distributed to the hoppers. As the hopper fills, the excess water drains through spillways into the sea; nevertheless, the remaining



Looking down into cargo hopper. Continuous gate system in center. Note excess-water screens on both sides.



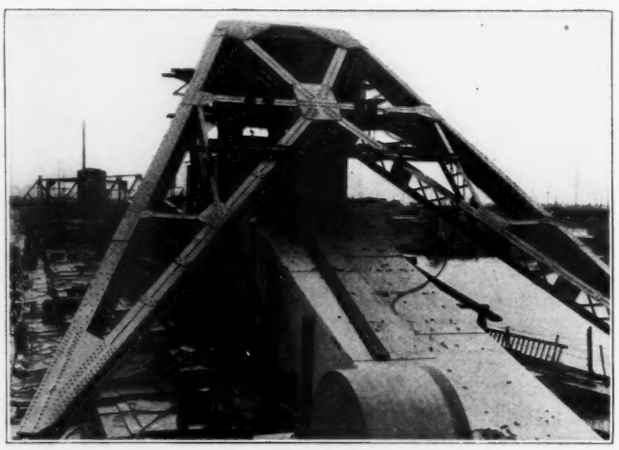
Showing relative size of the huge sand-pump casing.

sand contains from 15 to 20 per cent water. Obviously, the removal of this water would permit the carrying of a greater pay-cargo without increasing the ship's draft. Both sidewalls on each hopper have specially designed screen panels placed along the bottom near the horizontal gates. Each panel has several fine-mesh screens with a heavier screen overlaid for protection against damage when large size materials are carried. The entire length of screens is backed by a double-compartment wall terminating in a flume which serves to collect the water. This flume, in turn, extends to the engine room where a Westinghouse 16-in. centrifugal pump discharges the water overboard. This system completely removes all the excess water, enabling the material to be handled and unloaded dry by the belt-conveyor system. An additional 2,000 tons of pay-cargo can be carried through its use.

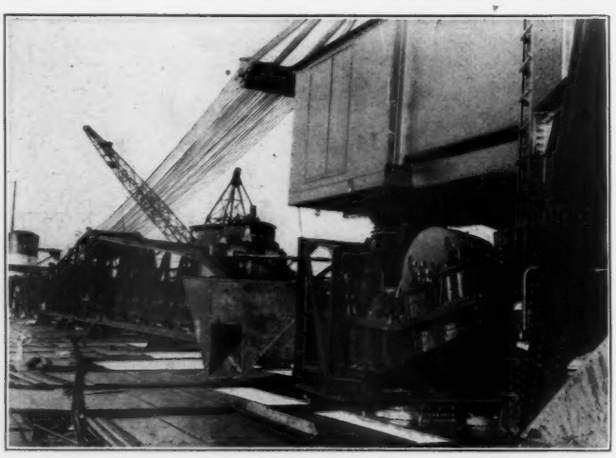
This, then, describes the construction and operating features of the hoppers. The loading-and-unloading mechanism begins with, naturally, the dredge pumps.

Two centrifugal sand-pumps, each having a 30-in. suction and a 28-in. discharge and installed in the engine room, represent one of the largest dredge-pump installations ever built. Tandem 750-hp. motors on each pump provide in excess of 1,500 hp. when required and only 750 hp. under lighter loads. Provision has also been made to increase this to 2,460 hp. when needed. This tandem motor is, in reality, two motors, there being two stators and two rotors, the latter being integral on one shaft. They are wound for 2,300-volt, 50-cycle, alternating current and are automatically controlled so that, when the load exceeds the power of one motor, the second automatically cuts in. An exceptional economy results, with a wide range of power thus provided. For maximum head and long discharge-line operation, the two sand pumps are connected in series using the port unit as a booster. Under these conditions the pump motors develop in excess of 3,000 hp. with a discharge pressure of approximately 110 lb. per sq. in. Between the pump and the motor, a Fast flexible coupling is employed. The pump-shaft has a Kingsbury thrust bearing and an SKF, the latter said to be one of the largest pump-shaft bearings of this type ever used. Both pumps were designed by the company's staff and were built by the Worthington Pump Co. The impeller casings are fitted with renewable Wormpco manganese-steel liners.

From the pump locations in the engine room, the suction piping of each unit extends to its respective side of the ship. The overboard length has a squared end which fits into a grooved way extending



Patented A-frame of boom conveyor. Note its low height and massive construction.



View of boom conveyor. Note multiple-sheave wire-rope assembly.

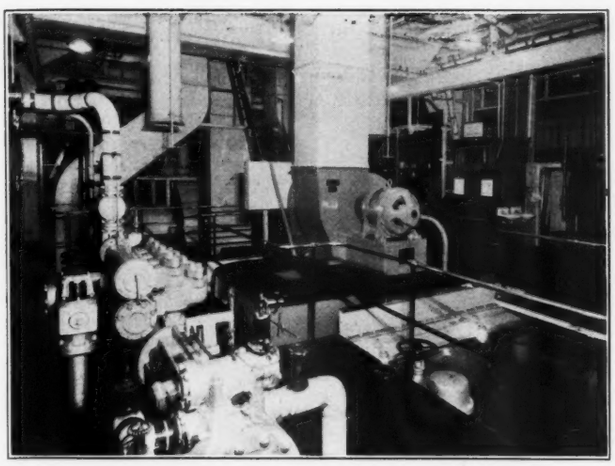
vertically on the ship's side, terminating below the water-line, where it coincides with the interior suction piping. Two A-frames, each equipped with a wire-rope hoist, handle the movement of the pipe, swinging it to overhead supports out of the way when not in use. Two types of suction hoods are used on the outer end of each overboard pipe. One type is used for a shallow bed of sand, the ship dragging the hoods along while under its own power. The other type is used when the ship loads in deep sand from one position. Under this condition, the ship is anchored from the fore and aft ends, and the overboard suction pipe operates from a horizontal to a vertical position.

The discharge piping consists of two systems—

one which sends the pumped material to the hoppers, and the other to the overboard pipe-lines for wet unloading.

For loading the hoppers, the discharge lines are carried to two inclosed flumes which extend the full length of the cargo hold, one on each side under the deck level. These flumes are equipped with a classifier screen at each hatch for loading desired sizes of material. Oversize material is thereby rejected and sent overboard. The amount of material for each hopper is controlled by closing the classifying screen gate.

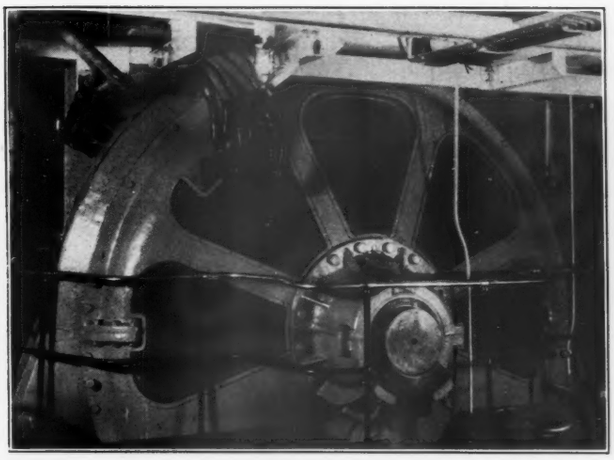
A special pipe-line arrangement with several interesting features is used to connect the pump-discharge lines with the short pipe-lines. Flexibility in the coupling of the ship discharge pipe-line to the



A view of the engine room.

shore lines has always been a difficult problem. On the *J. R. Sensibar* it has been handled in an unusual way, a monorail hoist and several swivel joints solving the problem. The discharge pipes from the pumps extend through the deck terminating in a swivel-elbow overhead. A horizontal length extends from the swivel to an overhead monorail which may be swung over the side of the ship. A short vertical length extends downward from the elbow at the monorail, and has a double swivel female coupling on its end for the shore-line. This special arrangement takes up the difference in the loaded and light conditions of the ship as well as any fore-and-aft, trim, and thwartships rolling motion.

As it is often necessary to load the ship at one point and unload for a fill at considerable distance away, provision has been made to unload the dry materials in the hoppers by means of the two main pumps. Eight wells, three for the aft section of the cargo hold, three for the middle section, and two for the fore section are connected to a pipe-line extending the suction of the main pumps. These wells consist of square-section vertical tanks, placed between the two hoppers, with access to them through a series of gates placed one above another on two sides of the well. By means of a series of nozzles located below the hatch covers, powerful jets of water are directed against the surface of the cargo, washing it into the wells through the gates. Two

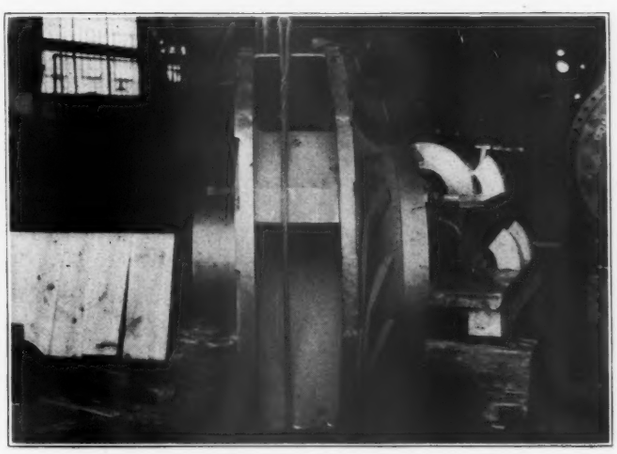


Main propulsion motor rated at 3,000 hp. at 100 r.p.m.

12-in. Worthington centrifugal pumps send a total of 10,000 gal. per min. to the nozzles. The upper gates of the wells are opened first and, as the cargo level lowers, the succeeding lower gates are opened until the hopper is empty. Since 10,000 gal. per min. is not enough to supply the two main sand pumps, it is necessary to admit sea water to make up the balance. This make-up water is admitted through a long inclosed flume placed between the hoppers at the tank top level with entrances to the eight wells.

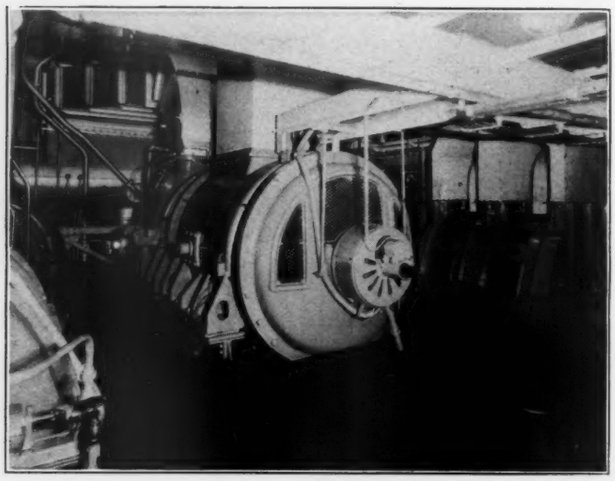
One of the most interesting features aboard the *J. R. Sensibar* is the means of controlling the flow of materials through the suction-and-discharge piping valves. All the valves in the sand-pump systems are electric-motor driven, there being 27 of them, all furnished by the Michigan Valve Co. and equipped with Cutler-Hammer motor-control units. Two control panels, one located in the engine room and one on deck, are not only in control of the valve positions, but have flow diagrams of the suction-and-discharge-piping with pilot-lights indicating the position of each valve gate. At a glance, the operator can see the source of the material pumped and its destination. Two pilot lights, one a red, the other a green, tell the story for each valve.

When unloading "wet," the engineer in charge of the pumps is advised, by means of an electric signal system, of the condition of the section being un-



Huge impeller of one of the 30-in. centrifugal sand pumps.

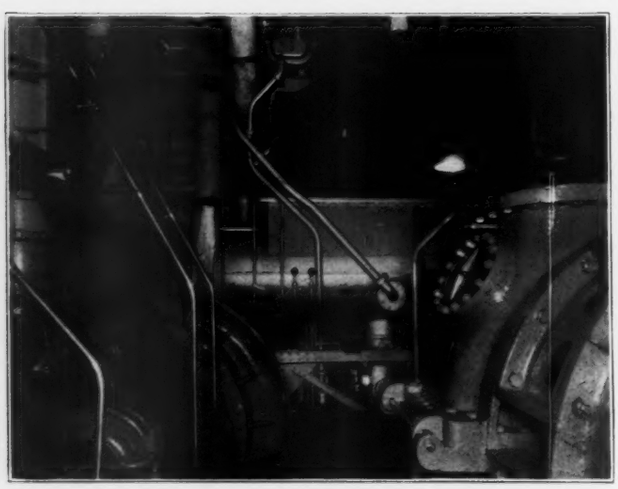
loaded. At each well, just below the hatch, the well gates are operated by hand and, mounted nearby, is a push-button signal switch for the operator. By pressing the different buttons, the engineer in the engine room receives the signal and manipulates the flow of material, by opening or closing the proper valves.



Steam-turbine-driven generator, with tandem sump motor at right.

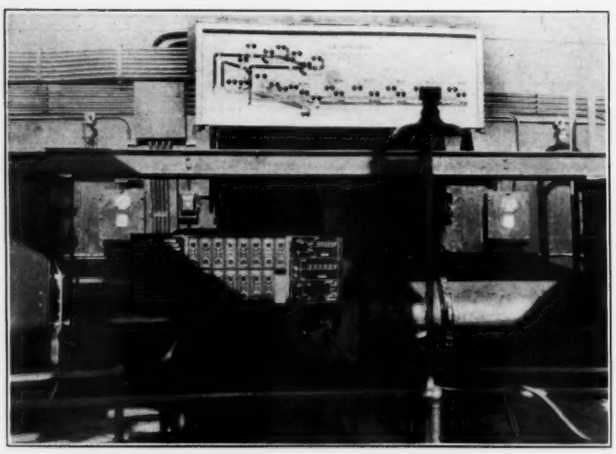
The dry-material-unloading method is one of the most interesting features of the boat. Essentially it is simply a belt-conveyor system, the two hoppers of the cargo hold unloading directly onto two 48-in. conveyors. These, in turn, discharge to cross conveyors which, in turn, send the material onto the deck conveyor and this, finally, feeds the long boom-conveyor for unloading onto the dock-piles. The details, however, presented many difficult problems of design and, as stated early in the article, the boom conveyor, having the most noteworthy features of its kind anywhere, is an engineering triumph.

Beneath each of the two parallel hoppers is located a 48-in. belt conveyor, directly below the continuous gates. Both conveyors extend the full length of the cargo hold and to the conveyor room in the fore part of the ship—a total length of 383 ft. from the pulley centers. Each conveyor has a capacity of 2,000 tons per hour and is driven through a tandem-drive pulley by a 100-hp. motor with an Allis-Chalmers Texrope drive. From the head pulleys of these conveyors, two cross conveyors transfer the material to the 60-in. inclined conveyor located in the center, which raises the material from the hold to the boom conveyor. Each cross conveyor is 10 ft. long and the inclined unit 128 ft. long. The latter is driven through a Falk speed reducer powered by a 200-hp. motor. Robins Conveying Belt Co. belting, idlers and return rolls were selected for all conveyor units.



The engine room. Turbine generator on right, sand pump on left.

The boom conveyor which is the last of the system is carried on a structural-steel boom resting on a turntable at its tail end and suspended by a multiple-sheave wire rope assembly from the A-frame. The boom itself is 182 ft. in length overall. To permit the wide range of unloading—145 deg. from the ship's center-line—the A-frame support must carry the entire load yet not be in the way of the swing. This was accomplished by having the anchor pin of the tackle block at the A-frame supported from an extension, clearly seen in a side view photograph of the ship. The two back legs of the A-frame are anchored by steel castings and pins with tie rods riveted to an arch construction below deck. They are adequately braced by a truss structure and, below deck, the foundation is sufficiently strengthened by additional structural members. This A-frame is but 30 ft. high, the lowest on the lakes, yet carrying the longest conveyor with the widest range—a reaction of 600,000 lb.



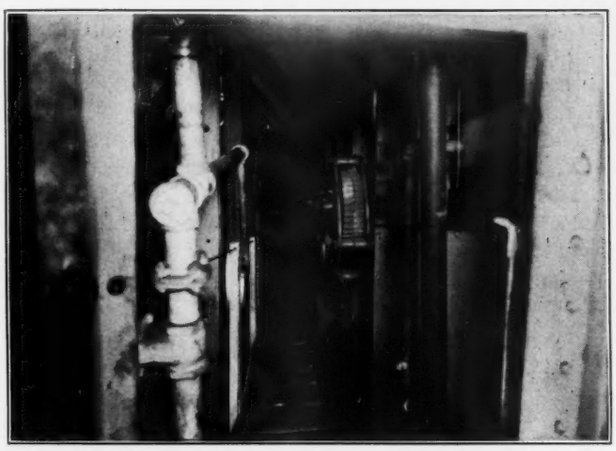
Electric valve-control board showing positions of motor-driven suction and discharge-piping valves.

The boom is manipulated by means of a multiple-sheave wire-rope tackle consisting of a Huron Industries, Inc., hoist with a 50-hp. motor, both mounted on the boom itself near the tail end. The tackle has a 21-sheave head pulley and a 22-sheave tail pulley, carrying 3,340 ft. of American Steel & Wire Co. 7/8-in. wire rope. This is probably a record installation—representing a total load of over 700,000 lb. The conveyor part of the boom consists of a 60-in. belt, 170 ft. on centers. It is driven through spur gears by a 250-hp. motor, the entire drive being mounted on the opposite side of the turntable to offset some of the weight of the boom. Fairly deep

skirt-boards permit a maximum loading of the belt and, at normal speeds, 4,000 tons can be discharged per hour. About 21 deg. is the maximum angle at which the boom conveyor can be successfully operated, which permits unloading to a height of 80 ft. above the waterline.

From a marine-engineering point of view, the *J. R. Sensibar* also is a model of design. Its engine room is equipped with the latest equipment, being electrified throughout. Stoking the boilers by hand "just isn't done," pulverized-fuel equipment supplanting this laborious task. The designers and owners claim that this is the first installation of pulverized-fuel firing aboard a ship on the Great Lakes.

The ship is propelled by a General Electric turbine-electric drive, consisting of a steam turbine direct-connected to an alternating current, 3-phase, 50-cycle generator operating at 3,000 r.p.m. producing 848 amp. at 2,300 volts. Current is supplied to



Tunnel view showing reciprocating gate-lever mechanism.

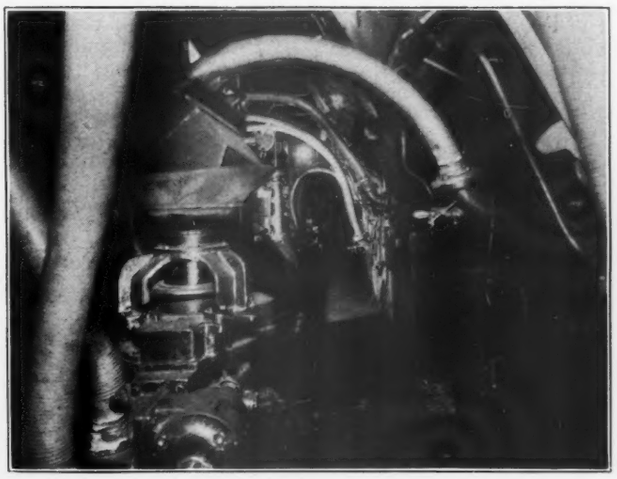
a single propulsion motor rated at 3,000 hp. at 100 r.p.m. The control provided permits of 20, 40, 60, 80 and 100 r.p.m. From 80 r.p.m. to 100 r.p.m.—which is the normal operating range—the motor operates by turbine-governor speed control. Another turbine-generator, a 750-kva. Westinghouse unit, is used as an auxiliary unit. It has a 75-kw., 115-volt, direct-current exciter direct-connected to it.

An interesting feature of the propulsion motor is the precaution taken to prevent moisture from getting into the field coils when the ship is laid up during the winter months. Special Cutler-Hammer heater coils are installed—furnishing just enough heat to keep the windings warm.

For utility purposes, two steam-driven 10-kw. generating sets are installed. In addition there is a 35-kw., steam-driven generating set which is used for utility and as an exciter for the propulsion motor.

Steam is produced by three Scotch-type marine boilers, at a working pressure of 180 lb. per sq. in. They are fitted with Ellis and Eaves induced-draft fans and Foster superheaters which produce a 200-deg. superheated steam, the latter being required for satisfactory operation of the turbine.

Pulverized-fuel combustion was selected because of its efficiency and economical operation. Three Todd triplex pulverizers were installed, each connected to its boiler by a flexible metallic hose. The coal bunker of the vessel carries run-of-mine coal which is sent to a crusher via bucket elevator. This crusher reduces the coal to a size suitable for the pulverizers and sends it into a service bunker from



Boiler room of the "J. R. Sensibar." Pulverizers at left, three Scotch-marine boilers on right.

which it passes to the three pulverizers. In addition to the pulverized-fuel system, an oil burner is installed on each boiler to be used for stand-by firing when the ship is not in service. This equipment also was furnished by the Todd company.

In line with the fine engineering practice used in the ship's propulsion machinery, the owners secured the services of the late Rear-Admiral C. W. Dyson to design the propeller. With the same reasoning, an Oertz rudder, which enables a better stream-line flow to the propeller, thereby increasing the ship's

Pilot-house interior showing remote control on right.

speed, was installed. This type of rudder improves the ship's steering and maneuvering ability as substantiated by reports from the first voyage. Another innovation in the propeller-shaft mechanism is the use of a Goodrich rubber cutless-type stern bearing. Successful use of this type of bearing on

the *Sandmaster* during a period of four years led to its use on the *J. R. Sensibar*. On the new vessel, however, a 15-in. stern shaft necessitates the use of what is considered the largest rubber bearing ever installed on a ship. Bearings of this type are water lubricated.

As mentioned earlier, the *J. R. Sensibar* can be pilot-house controlled. A special remote-control system has been worked out by the owners whereby the propulsion motor can be started from the pilot house or from the engine room at will. It is claimed that this is the first ship so equipped. The pilot-house-control equipment includes a Kolster radio compass, magnetic compasses and the usual engine-room signal apparatus. The steering-gear control is of the telemotor type, a rudder indicator showing the position of the rudder at all points. This equipment was furnished by the Benson Electric Co. of Duluth, Minn.

Tunnel conveyor in foreground. Incline conveyor upper right.

Some of the other important items of machinery in the engine room consist of the condenser, air compressor, and many pumps. As easily imagined, there is a multiplicity of pumps on this type of vessel. The condenser employed is of the single-pass type having a surface area of 4,300 sq. ft. An auxiliary condenser of 700 sq. ft. of cooling surface is provided for steam auxiliaries when required. Some of the important pumps are: a double two-stage ejector with inter-and-after cooler; a 16-in. motor-driven centrifugal pump for condenser circulating; a 3-in., 2-stage centrifugal condensate pump; and a 7½-in. by 7-in. by 10-in. duplex piston pump for the auxiliary condenser condensate.

For supplying the hopper jets, two 12-in. centrifugal pumps are installed. For the clean-up service (disposal of drained water from the tunnels), there are two 6-in. pumps. The boiler feed is handled by one 2-in., 2-stage centrifugal and one 14-in. by 8-in. by 12-in. horizontal boiler feed pumps. A 10-in. by 12-in., 12-in. by 12-in. combined air and circulating pump serves the auxiliary condenser. For bilge service, one 6-in. by 5¾-in. by 6-in. horizontal duplex pump is installed. All the above equipment, beginning with the condenser, was furnished by the Worthington Pump & Machinery Co.

The entire electrical equipment, for pumping and wet and dry unloading was supplied by the Westinghouse Electric & Mfg. Co.

Excellent provision has been made for the comfort of the crew. It is hard to conceive a more livable, homelike atmosphere than can be found on this vessel. In the forward house, a most comfortable reception room is provided. Surrounding it are four attractive sleeping rooms for the owners' guests. These rooms are tastefully furnished and are decorated in modern style and there is an adjoining bath for each two rooms. Above the reception room is an observation room. This room, surrounded on three sides with windows, commands a beautiful marine view. It is complete with living-room furniture and a radio set of the latest type. A small kitchenette, adjoining the reception room, is completely equipped, even with the latest type of General Electric refrigerator.

In the rear house, the ship's dining room and culinary department are maintained. The officers' dining room adjoins the crew's, together forming one of the most attractive spots on the ship. The kitchen is supplied with the latest kinds of equipment, including electric toasters, griddles, broilers, steam table, coffee urns, mixing machines, potato peeler, dish washer, and a good-sized coal range.

The crew's quarters are models of comfort. Each senior officer has his own room. The captain and the chief engineer each has his own office adjoining his stateroom.

Complete life-saving equipment has been installed.

Production of Sulphur Breaks All Records During 1930

With a production of 2,558,981 long tons, sulphur output in the United States reached new high levels in 1930, according to the U. S. Bureau of Mines. This is an increase of 8 per cent over the output of 2,362,389 tons in 1929, the former record year. Shipments decreased, however, from 2,437,238 tons, valued at approximately $43,800,000, in 1929, to 1,989,917 tons, valued at $35,800,000, in 1930, or declines of 18 per cent in both quantity and in value. The large decrease in shipments is due principally to a decrease in exports from 855,183 tons in 1929 to 593,312 tons in 1930, a drop of 31 per cent. Domestic shipments decreased from 1,582,000 tons in 1929 to 1,397,000 tons in 1930, or 12 per cent. The high rate of production in 1930 accompanied by declining domestic shipments and exports resulted in an increase in producers' stocks from 1,928,000 tons on January 1 to 2,497,000 tons at the end of December—a net gain of 569,000 tons.

Production in Texas was continued at all properties that were active in 1929, and a new property, at Long Point, Ft. Bend County, was put into operation by the Texas Gulf Sulphur Co. in 1930. Other properties that contributed to the output in 1930 were those of the Texas Gulf Sulphur Co. at Gulf, Matagorda County, and Newgulf, Wharton County, Bryan and Hoskins Mounds of the Freeport Sulphur Co. at Freeport, Brazoria County, and Palangana Dome of the Duval Texas Sulphur Co. at Benavides, Duval County.

The steamer "Lakewood" unloading at the Hertel Ave. plant. In the foreground are David Hyman, president, and H. A. Stelley, engineer.

Gravel Dredged From Lake Processed at Six Shore Plants in Buffalo

Methods of Handling Materials Typified by Corporation's Hertel Ave. Operations

WITH lake-going freighters transporting materials to and from the dock of a Buffalo aggregate plant, facilities for rapid and efficient handling of materials had to be provided. Not only are materials handled in and out of boats, but rail and truck shipping also form a large part of the business of the Buffalo Gravel Corp. In the busy season operating costs of these lake vessels sometimes run into three figures per hour, hence the need of their rapid loading and unloading can be readily understood.

This complexity of requirements created an interesting problem in materials-handling engineering, and the manner in which it was treated is worthy of note.

Buffalo Gravel Corp. operates six yards—five within the city of Buffalo and one at North Tonawanda, ten miles north. Each of these plants is located on the water front; each of them is equipped to load directly into trucks, and nearly all are equipped to load into cars.

David Hyman, president of the company is well known in the sand-and-gravel industry, having been for some time a director in the National Sand & Gravel Assn. He is likewise active in the affairs of the Empire State Sand & Gravel Producer's Association. R. W. Eberly is vice-president. John H. Kilby is purchasing agent. H. A. Stelley, engineer and designer of much of the equipment used at the various plants, is also an active association member, having held offices in the Empire State Association and now serving as a member of its executive committee.

The materials for the Hertel Ave. plant, about which this article is written, are obtained from beds in Lake Erie, about eighteen miles from Buffalo. The four boats in use at present are the *Lakewood,* which has a capacity of 1,400 cu. yd., with a 20-in. pump; the *Weston M. Carroll,* which has a capacity of 1,100 cu. yd., with a 15-in. pump; the *Victoria,* which has a capacity of 700 cu. yd., with a 15-in. pump; and the *Myron L. Hyman,* which has a capacity of 438 cu. yd., with a 12-in. pump.

For unloading these boats at Hertel Ave., two McMyler steam-driven derricks, each equipped with a 65-ft. boom and a 3-cu. yd. clamshell bucket, are operated along a dock, approximately 375 ft. long, on the Niagara River. The derricks travel on a 15-ft.-gauge track, the near rail being 10 ft. from the face of the dock. Taking a bucket of gravel from the boats, the derrick swings through an arc of approximately 180 deg. to the raw-storage stock-pile.

This raw-storage stock-pile extends for a length

The 8-in. crusher discharging to No. 3 belt conveyor.

of 250 ft. and has a capacity of 40,000 tons. Beneath it, a tunnel conveyor system has been installed on a line 55 ft. from the face, and parallel to the dock. The tunnel is 7 ft. wide and 6½ ft. high and has 12-in. reinforced-concrete walls throughout. At 7-ft. intervals in the ceiling, a dumping gate is placed to load the conveyor belt.

The dock tower for loading material to boats.

Belt conveyor No. 1 is installed off-center of the tunnel to permit a man to walk alongside for manipulation of the dumping gates. This belt conveyor has a total length of 365 ft. and is equipped with a 30-in. belt. After leaving the tunnel, it rises to a height of 32 ft. at the point of discharge in the crusher house.

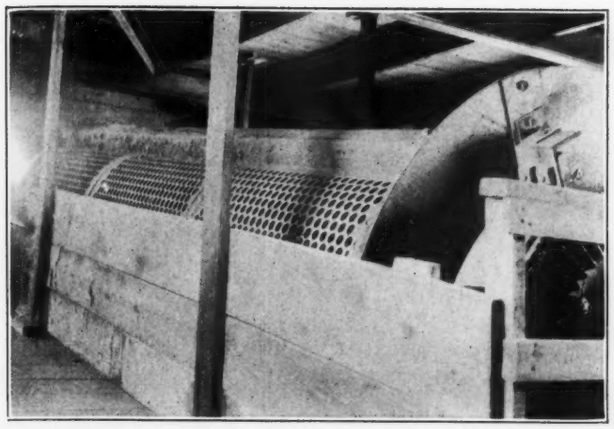
From conveyor No. 1, the material is spouted directly into a 4-ft. by 20-ft. Link-Belt rotary scalping screen fitted with three sections of 5/16-in. plate perforated with 1⅞-in. round openings. The oversize falls into an 8-in. Allis-Chalmers Superior-McCully crusher, directly below. The throughs pass to conveyor No. 3 leading to the washing screens.

Arrangement of the inclined conical washing and sizing screens.

From the crusher, a return-circuit conveyor No. 2 with a 24-in. belt sends the crushed material back to conveyor No. 1 for re-screening. A 30-hp. motor operates conveyor belt No. 1; a 20-hp. motor drives the rotary screen, and a 25-hp. motor operates the crusher.

An inspection of the crusher house will reveal the types of construction used throughout. The belt conveyors are equipped with Link-Belt anti-friction, 3-roll idlers and return rolls. This type of idler, which is equipped with Alemite lubrication fittings,

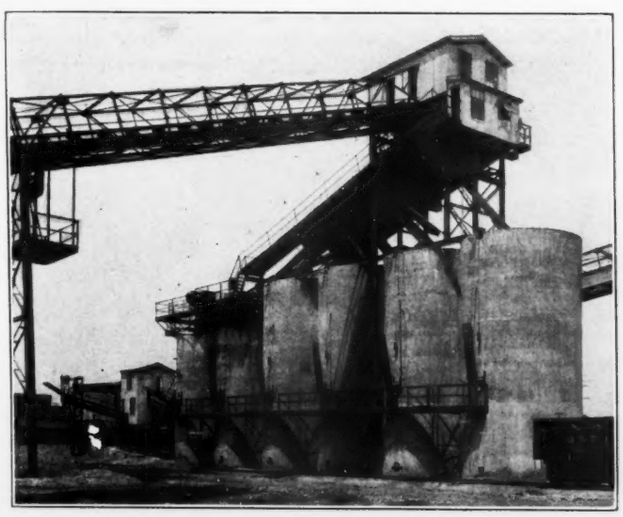
Arrangement of flight conveyors for dewatering sand.



Scalping screen at the top of the crusher house.

requires attention but three times a year—in April, July and October. The steel-frame buildings are enclosed with copper-bearing, corrugated-iron sheeting. All the conveyor structures are fabricated of structural-steel shapes, while downspouts and chutes are cut from steel plates. The crusher foundations are of concrete. Permanent, fireproof construction throughout is the principle upon which this plant is built. Adequate provision is made for expansion. Even in the crusher house, space is left for additional units should increased capacity demand their installation.

Conveyor No. 3 transports the material from the crusher house to the washing screens above the



Silo-type loading bins with washing and sizing screens above.

loading bins. This conveyor has a length of 179 ft., is 30-in. wide, bringing the material to an elevation of 67 ft. at the top of the washing plant, using a 25-hp. motor.

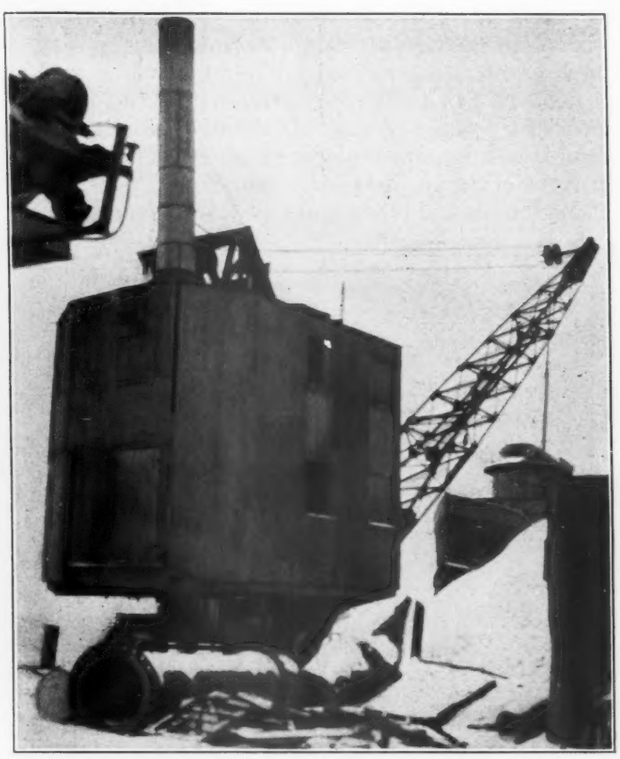
The structure carrying the washing-screen equipment and the sand-settling tanks is mounted above six circular reinforced concrete bins. Two lines of Link-Belt Dull screens are used, each having three conical units. Each line of screens has the following sizes of square opening, respectively: 1⅛ in., 9/16 in., and 5/16 in.

One set of screens is equipped with standard steel plate. The other set with manganese-steel wire

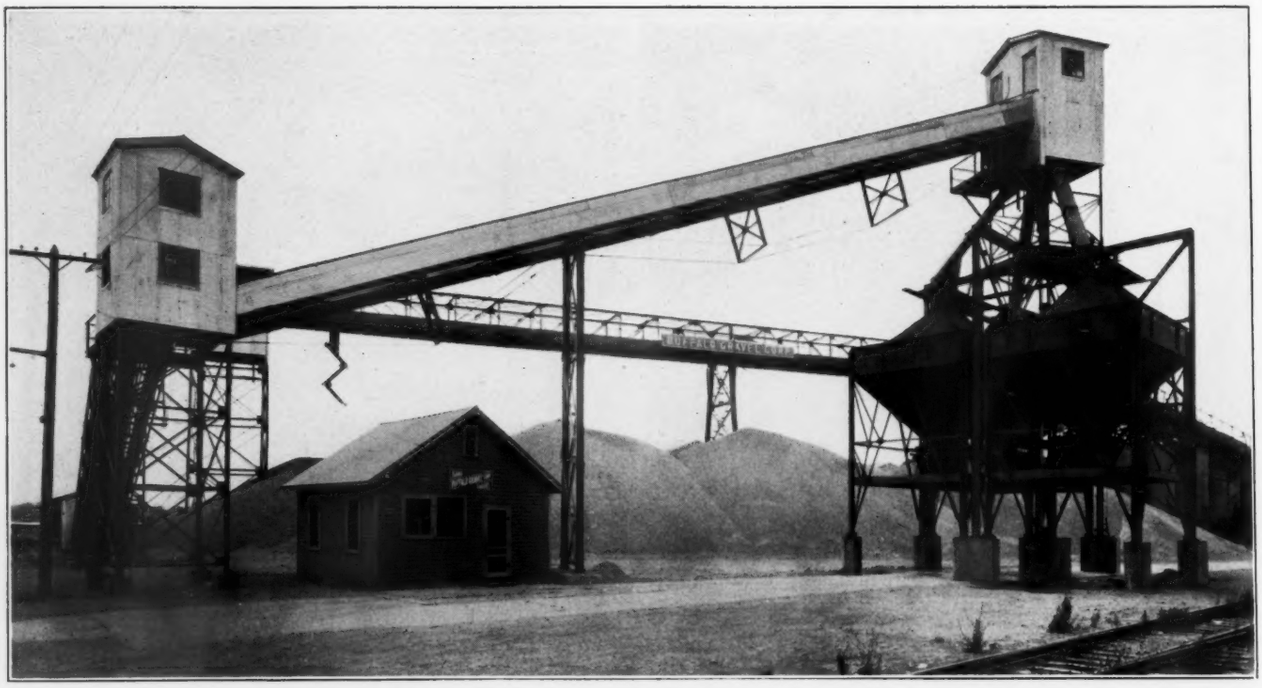
The three-hopper batching bins.

cloth made by the Manganese Steel Forge Co. Each unit is a standard Dull screen 96 in. long, 72 in. in diameter at the large end and 36 in. in diameter at the small end. Each line of screen is individually driven by a 15-hp. motor.

Undersize materials from the last screens pass to the two sand-washing boxes via a wide flume. The



Steam-driven derrick which unloads barges to raw-material pile.

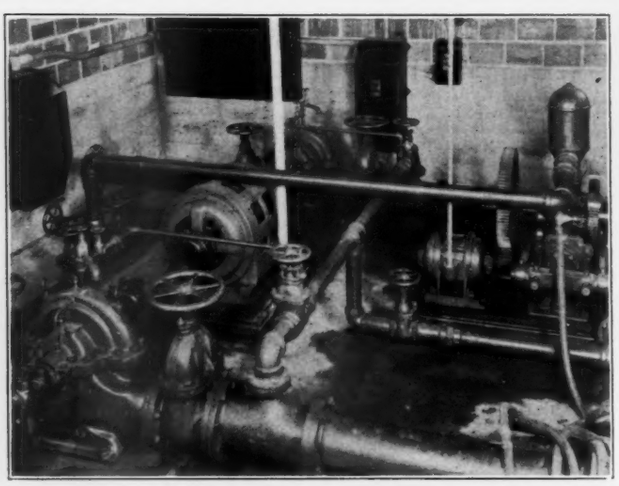


A view of the open-storage and batching portions of the Hertel Ave. plant.

two boxes are arranged side by side with opposite direction of flow so that the discharge of each is made directly to its own bin. Each box is 33 ft. long, 5½ ft. wide and 7 ft. deep, and is equipped with a flight conveyor consisting of flights ⅜ in. thick, 6 in. wide and 4 ft. long, fastened at each end to a manganese-steel chain of 6-in. pitch. The flights are spaced 12 in. apart on this chain. A 10-hp. motor operates the flight conveyor in each box.

Wash-water is supplied to the screen by two Gould 6-in. centrifugal pumps, each driven by a direct-connected 60-hp. motor. Water is supplied by each pump at the rate of 1,100 gal. per min. against a head of 145 ft., with a pressure of 29 lb. at the nozzles in the screens. A Goulds 6-in. by 12-in. double-acting, single-piston pump driven by a 5-hp. motor serves to prime the centrifugal pump.

Both cars and trucks may be loaded from any one of the bins, four being used for gravel and two for sand. The bins are 20 ft. outside diameter, of 8-in. reinforced concrete. The four gravel bins are 40 ft. in height, and the sand bins are 32 ft. high. They have a rated capacity of ten cubic yards for each foot of height. On one side of the bins, gates are provided for car loading and, on the opposite side, the gates face a truck lane for the purpose of loading trucks. A steel walkway on each side of the bins permit the operator to manipulate the Link-Belt segmental-type gates and spouts. Belt conveyor No. 4 is installed alongside the bins on the truck-loading side, supported by the frame of the walkway. Gates are installed in the bottom of the regular chutes to the trucks. When these gates are raised the material from any or all of the bins is fed to the belt conveyor. Mixed materials can thus be loaded using this conveyor belt which brings the



Centrifugal pumps that handle waste water, and priming pump at right.

Arrangement of loading gates on truck-loading side of bins.

material to a transfer house, a steel tower structure beyond the last sand bin. From the hopper at the head end of conveyor No. 4 this mixed material is sent, via short conveyor, No. 4A, to the cars. Separated material from any of the bins is also handled by conveyor No. 4 to this transfer house. From the transfer house, an incline conveyor, No. 5, elevates the material to a gallery conveyor, No. 6, which, at a height of 50 ft. above the ground, extends for a length of 243 ft. over the stock-pile. A tripper, equipped with a trailer to prevent backsliding, discharges the material to any desired point along conveyor No. 6. Conveyor No. 4 is 24 ft. wide, 148 ft. long, and is operated by a 15-hp. motor. Conveyor No. 4A is 24 in. wide, 21 ft. long, and is operated by a 5-hp. motor. Conveyor No. 5 is 24 in. wide 236 ft. between centers, and is operated by a 25-hp. motor. Conveyor No. 6 is 24 in. wide, 243 ft. between centers, and is operated by a 15-hp. motor.

To handle material from the stock-piles an extension of the dock track for the derricks has been made to a position parallel to the dock track and between the raw- and washed-storage piles, from which the derricks may load either raw or washed material into cars. Underneath the washed storage, a tunnel-conveyor system has been installed, using conveyor No. 7, 30 in. wide, 295 ft. between centers with a 30-hp. motor drive. At the head end of conveyor No. 7, the material is discharged into a cast-steel turnhead, permitting the material to be fed to either of two conveyor belts. One conveyor, No. 8, 30 in. wide, approximately 250 ft. between centers, and operated by a 40-hp. motor, leads to a loading tower at the dock for loading the material to barges, which are transferred to any of the other yards. From the foot end, conveyor No. 8 extends through a tunnel 93 ft. in length. The railroad track extends from alongside the bins to a position over the roof of this tunnel. At this point a hole has been made in the roof, and a 30-in. feeder belt No. 9 operates in the tunnel between conveyor No. 8 and the ceiling. A hopper installed between the railroad tracks and above the tunnel permits coal to be transferred from railroad cars via conveyor No. 8 to the lake-going boats, as necessary.

From the cast-steel turnhead, the material is fed to another conveyor, No. 10, which leads in an opposite direction to conveyor No. 8, rising to a height of approximately 38 ft. in a transfer house where the material is discharged to another conveyor, No. 11, elevating material to a position over three 108-cu. yd., two-compartment Erie bins. Each of these batching bins is equipped with a 5,000-lb. Erie Aggremeter. By the use of these three bins, any size or proportion of materials may be batched into trucks. No. 7 conveyor has been equipped with a Merrick scale whereby all of the material passing over this conveyor to either No. 8 or No. 10 conveyor is also accurately weighed.

Deliveries are made with the company's own fleet of motor trucks, consisting of seven Pierce-Arrow 5-ton units, two Diamond T 5-ton units and one Diamond T 7½-ton unit.

Crawler-Wagons Transport Material at Small Kentucky Plant

THIRTY miles north of Paducah, Ky., along the line of the Illinois Central Ry., at a siding known as Gravel Switch, an extensive deposit of gravel constitutes the natural resource upon which commercial activities are maintained by the Memphis Stone & Gravel Co. Only one grade of material is produced, a size suitable for road surfacing.

The railroad company owns 200 acres of this deposit and the Memphis company owns 300 adjoining acres. All excavation upon both properties is done by the latter company. The gravel bed varies in depth between 20 and 100 ft., and is overlain by 3 to 7 ft. of worthless soil which is stripped by an Erie Type B shovel mounted on crawlers. The overburden is loaded into Western Wheeled Scraper Co. 7-cu. yd. crawler wagons and hauled to the waste-disposal dump.

The preparation of the single product is simple. The gravel is excavated by a number of Marion 37 steam shovels and loaded into Western 5-cu. yd.

Steam shovel loading tractor-drawn crawler-wagon.

dump cars. The loads are hauled by Vulcan steam locomotives, in trains of seven cars each, about one-half mile to the tipple which spans the railroad trackage. Two trains are sufficient to maintain steady operations at both the pit and the tipple.

Upon arrival at the tipple, the cars are dumped over a grizzly set with 2½-in. spacing. The oversize passes into a hammer mill and, after reduction, joins the balance of the gravel and drops into the loading bins ready for shipment as road material.

When the tipple is handling the railroad company's gravel in the preparation of ballast, the grizzly bars are set at 5-in. spacing.

A few Western 6-cu. yd., standard-gauge dump cars are held in reserve for the disposal of the grizzly oversize whenever anything goes wrong with the crusher.

Although the equipment is simple and the chief units are few in number, this plant has a large daily capacity. At times, 200 standard-gauge gondolas have been loaded in a 24-hr. day.

The officers of the gravel company are: W. L. Smith, president; W. E. Gamewell, secretary; and W. H. McDonald, general manager.

The Use of Air-Classification Systems in Grinding Cement Clinker

By H. G. WRIGHT
Research Engineer, The Hardinge Co.

IT has been definitely established that there is a very decided drop in the output of a clinker-grinding mill at a discharge temperature of approximately 270 deg. F. This phenomenon is probably due to the dehydration of the gypsum which releases moisture in the charge. One of the greatest disadvantages incident to the grinding of clinker has been due, in numerous instances, to the excessive overheating of the charge which resulted in very appreciable lowering of the mill capacity.

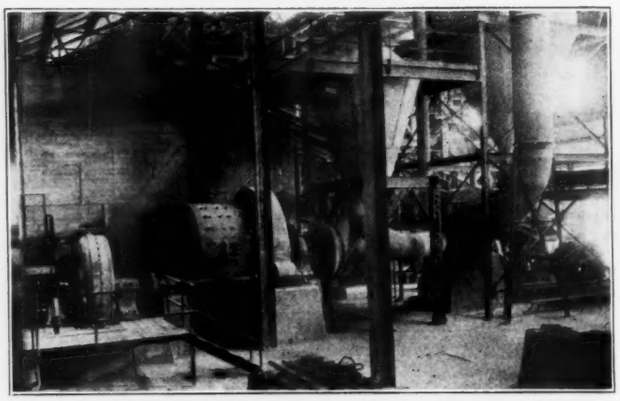
The system under discussion operates at a temperature of approximately 160 deg. F. when grinding cold clinker, which precludes any possibility of the discharge temperature ever approaching the critical figure referred to. The discharge temperature depends, of course, on the temperature of the clinker when fed to the mill, as there is a definite heat generation in the mill.

It is believed to be a fact that the grindability of clinker increases with the rapidity of cooling. For this reason, and to insure a low mill-feed temperature, the writer believes that more attention should be given to the size and design of clinker coolers. There is so much available heat in a cement plant that the complete utilization of the heat released in the cooling of the clinker will be a slow development. Every effort should be made, however, to conserve or dissipate this heat, in order to insure a cool clinker feed to the finish mills.

There is some reason to believe that the resistance to grinding of a given clinker increases as the fineness of the raw material from which the clinker is made, is raised. This will probably cause a balance to be found between the economical fineness of the raw material, cost of burning and cost of finish grinding. These three operations are so intimately interwoven that they must be considered in their relations to each other in order to get the best overall efficiency. It is possible that the raw material could be ground to a fineness which would give low costs of and satisfactory burning, but would result in prohibitive cost of finish grinding due to the increased resistance to grinding of the resulting clinker.

The accompanying photograph was taken of a 10-ft. by 66-in. conical ball mill with an air classifier using the reversed-current system, which has been in operation grinding clinker for about three years and is giving complete satisfaction.

It seems to be generally conceded that the impalpable portion of cement, say the sub 10-micron sizes, is not useful in the development of the best general utility Portland cement. These sub 10-micron sizes are produced in larger quantities at a loss of power consumption, in the long gravity discharge tube and compartment mills than in an air-separation type of unit. The system under discussion allows the clinker to remain in the mill a very short time, thereby producing a minimum of extreme fines. The ultimate use to which most cement is put is in the mixing of concrete, and the quality of the concrete should have consideration in the manufacture of the cement. To insure the best grade of concrete, each sand grain should be completely coated with cement, and it is believed that the angular, less rounded shape of the particles of cement prepared in air-classification systems will coat the sand grains more thoroughly than will cement made in other types of mills. The fact that there is a lower percentage of coarse particles in this cement is also a distinct advantage, as these larger grains do not react as quickly as do the fines, or do not react at all, and simply form a dilu-



Conical ball-mill and air classifier used to grind clinker in a cement plant.

ent in the cement. It is also probable that the angular shape of the particles of cement presents more surface in contact which would aid in the more complete hydration of the cement.

There is some evidence extant to the effect that so-called high-early-strength cements do not hold those strengths indefinitely and actually show retrogression over long periods of time. Considerable feeling has arisen among men of high professional standing to the effect that a good standard Portland cement which shows steadily rising strength curves and is known to give permanence over a long period of years is much more to be desired than a cement giving higher early strengths but doubtful permanence.

It seems to the writer that too much emphasis has been put on the characteristic of high early strength in cement. A sound reasoning would look for high later strengths and increasing permanence rather than the opening of a street or the removal of forms a day or two earlier. There is also much educational

work to be done in teaching the consumers the correct methods to use in applying standard Portland cement to their requirements.

The noise incident to the operation of most grinding mills, both raw and finish, is a nuisance which can be controlled to a large extent, at comparatively small expense. Many of the mills of the type under discussion which have been placed in service for grinding coal in power plants have been lagged on the outside and the noise reduced to a minimum. The noise made by most high-speed mills is deafening and that made by the slower-speed mills is bad enough. The reduction of this noise would undoubtedly have a beneficial effect on the nerves and morale of all persons who are compelled to work in or around this type of mill, and is well worth the earnest consideration of plant designers and plant executives.

There has been expressed at times a fear that a segregation of the gypsum, used for retarding the set of the cement, would occur in air separation units. This has been demonstrated to have no foundation of fact. Such segregation as has been encountered has been found to have occurred in the mill-feed bins where the gypsum had been added to the clinker prior to placing the mixture in the bins. This condition has been corrected by adding the gypsum to the clinker at the mill. The difference in the specific gravity of the clinker and gypsum does not seem to cause any harmful concentration of SO_3 in any particular range of sizes and the distribution is very good in actual practice.

There are many operating advantages offered by the unit referred to in this article. A very close control of the fineness of cement is becoming more and more important and the adjustments required on this unit for changes in fineness are exceedingly simple to make, and give the desired results quickly.

Repairs are low, as there is very little on these slow-speed machines which necessitates such work. Horsepower requirements per barrel are low and the ball and lining wear nominal. The operators of two of these units which have been grinding clinker for more than three years state that they estimate the life of the mill linings will be from six to seven years. This renewal item figures less than one-half of one mill per barrel of clinker produced. The ball consumption is about four-hundredths of one pound per barrel of clinker or less than one-quarter of one cent. In spite of the fact that clinker is very abrasive, the wear on the fan is low. This is due to the fact that the product does not pass through the fan, but only the dirty air which is separated out in the products collector. The dirt which is carried out of the products collector and through the fan is very fine and there is little of it, which accounts for the lack of excessive wear on the fan. This type of unit will handle clinker of higher moisture content than other types of mills, as part of the air in the system is vented to the atmosphere continuously, thereby carrying some moisture with it.

It is impossible to give capacities of these units, as the character and grindability of clinker from different plants vary widely. However, the 10-ft. by 6 in. conical ball mill with the reversed-current of air classification is actually handling 73 barrels of clinker, which has a high resistance to grinding, to a fineness of 91.5 per cent minus-200 mesh, and the same type and size of unit handles 78 barrels of a different clinker to 92.0 per cent minus-200 mesh. The total power consumption for this unit is 4.66 kilowatt-hours per barrel on one clinker when grinding to 92 per cent minus-200 mesh, and 4.97 kilowatt-hours per barrel on a different clinker when grinding to 91.5 per cent minus-200 mesh.

The reversed-current system of air classification makes a unit which is pleasing in appearance and is dustless in operation. The reason for this is the fact that the whole system operates under a slight vacuum except a short length of pipe between the fan and the mill.

Cement clinker grinds to a product which cleans easily in an air-classification unit, as there seems to be no tendency of the fines to stick to or coat the coarser particles. This is opposite to the characteristics of some raw materials and most notably in the case of calcined gypsum. This feature makes it an ideal material to handle in an air-separation system except of course that wear on all metal surfaces with which the clinker comes in contact is higher than is the case in the grinding of raw materials.

Because of the rapid wearing of surfaces when grinding clinker, the renewal of those portions of a grinding unit which are subject to wear is of prime importance. In the case of a ball mill, the greatest renewal is the balls themselves, and these are simply added to the charge when needed, along with the feed. The mill lining is probably the second item in importance and will last several years. With reference to this item, every mill man with whom the writer has talked on this subject and who had operated both vertical-end and conical-end ball mills, stated that he found it easier to reline the conical mill than to reline the vertical-end mill and that it took less time and men to do so. The elbows and other points in the piping, classifier and products collector, where there is excessive wear, are lined with sections which are easily and cheaply renewed when this becomes necessary.

The conical ball mill, which is the grinding unit used in this system, offers the advantage of automatic grading of the various sizes of balls to the correct diameter of the cone.

As is the case in the grinding of raw materials, the products collector used in the reversed-current system can be placed at sufficient height to discharge directly into an existing Fuller-Kinyon conveyor or other cement transportation system, thus obviating the necessity of any outside auxiliary handling equipment.

This unit, when fed by means of a constant-weight feeder, can be automatically controlled with great accuracy. This is being accomplished by means of an electric control dependent upon fluctuations in the mill motor current and also by means of a control which is actuated by variations in the quantity of circulating load returned to the mill. These devices insure a maximum feed to the mill at all times, thus increasing the total output.

Panoramic view of the operations of the Queen City Crushed Stone & Sand Co. worked-out

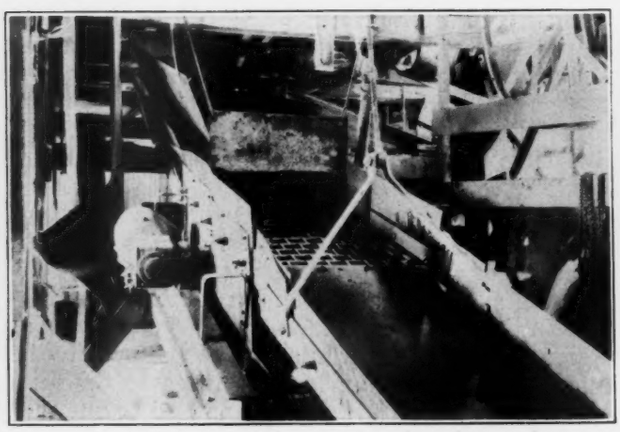
Concrete-Stave Storage Bins Installed by Producer Near Cincinnati

Batching Equipment Is Suspended Over Driveway Between Two Banks of Silos

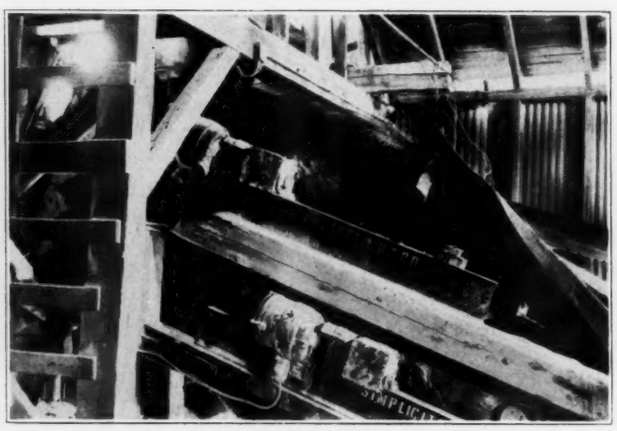
DURING the winter and early spring period of plant improvement, many aggregate producers are enlarging their storage-bin capacity or are replacing old bins which are beyond repair. Several types of bins are in common use: timber-frame, steel, reinforced-concrete, and concrete-stave types.

An excellent example of the concrete-stave type bins is found at the works of the Queen City Crushed Stone & Sand Co., at Miamiville, O. This plant is one of Cincinnati's chief sources of aggregates, producing an average of 1,500 tons per day. This company was faced with the necessity of rebuilding and enlarging its sand-and-gravel storage bins as well as making several other major changes in its plant equipment, all of which are described in this article.

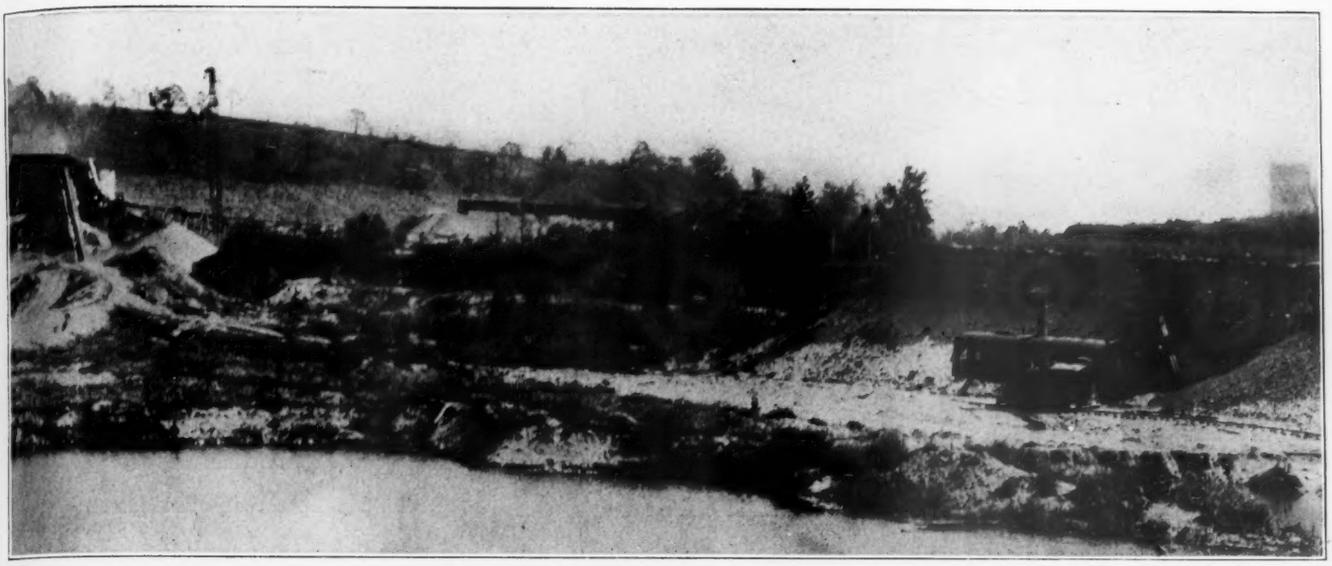
Four silo-type concrete-stave bins, manufactured by the Neff & Fry Co., Camden, O., were erected last year. Two of them are 16 ft. in diameter, one being 50 ft. and the other 42 ft. 6 in. high. The other two are 20 ft. in diameter, both 50 ft. in height. The concrete staves were manufactured in the factory at Camden, O., and were shipped to the location for erection by Neff & Fry men. Each stave has tongue-and-groove side joints with diagonally cut ends. They are 10 in. wide, 30 in. long, and 2½ in. thick. During the course of erection, galvanized-steel hoops were placed around the bin, spaced according to the internal-load requirements. A foundation as recommended by the factory was prepared in advance and, in the short space of a few days, the erection of the bin was completed. This method of construction permits rapid erection, as no mortar is used in the tongue-and-groove joints. Additional



Vibrating screen which scalps raw material.



Vibrating screens for classifying crushed stone.



portion of the pit at left, plant at center, and shovel operating in gravel bank at extreme right.

features of bins of this type are that they may be taken down readily and reassembled on a new location, or they can be increased in height or in diameter.

An interesting feature of the bin installation at the Queen City plant is the adaptation of the bins' circular shape to the batching equipment. Between the two rows of bins is suspended an Erie Aggremeter sand-and-gravel batching unit, having a sufficient capacity for a 3-cu. yd. concrete batch. This unit receives material from the bins on either side by means of chutes.

Mixed-in-transit trucks or dry-batch trucks back into the space between the silo bins and receive a weighed batch of aggregates from the Erie Aggremeter above. A further convenience has been provided for the trucking service in the addition of a cement-handling platform to the north of the bins. After receiving its load of aggregates, a mixed-in-transit truck is backed about 15 ft. to the platform, where the correct amount of cement is dumped into the mixer body. The cement is handled in bag form.

On the east side of the group of bins a roadway for the use of trucks has been provided, with access to the 20-ft.-diam. sand bin and the 20-ft. gravel bin. Accordingly, a batcher, unusual in design inasmuch as it is built to fit a circular bin, has been installed on each bin. These were built by the Superior Engineering Co. of Warren, O., and their capacity is designed for 1-cu. yd. concrete batches. Howe scales are installed on each batcher.

The means of supplying the storage bins with their materials is indicated in the accompanying flow-sheet of the plant.

Another major improvement at the Queen City plant is a complete Sauerman slack-line cableway installation equipped with a 2-cu. yd. bucket. The length of the fall line is 600 ft. extending over the gravel deposit below the water table—which was not possible with the old method of obtaining raw materials.

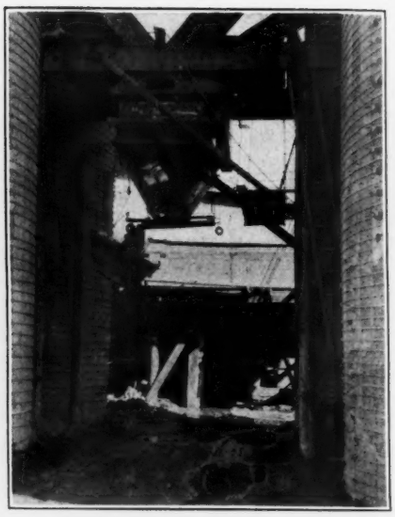
Formerly a crane equipped with a 1½-cu. yd. dragline bucket loaded materials into Western 6-cu. yd. cars which were hauled to and from the plant on an extensive intraplant track system. Another unit, a Bucyrus shovel equipped with a 2½-cu. yd. dipper, loaded materials from the west bank of the pit into cars on another branch of the track system. Inasmuch as the pit has produced gravel

Gyratory crusher and chutes from disk crusher and screen feeding to bucket elevator.

The 36-in. disk crusher receives oversize gravel from the first of the vibrating screens.

Weighing batchers alongside the bins.

John Sontag, superintendent.



Batching equipment between the silos.

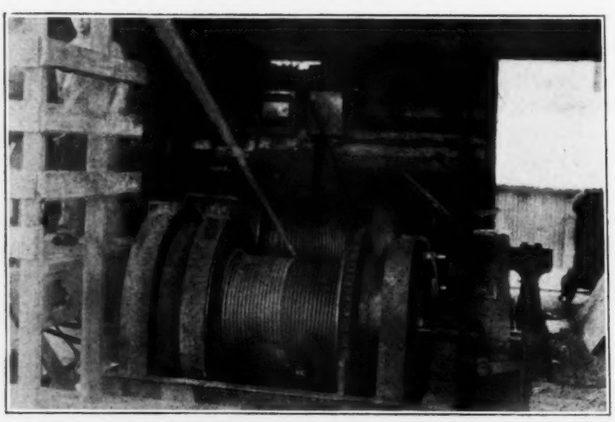
for a number of years, both the shovel and crane were in operating position a considerable distance from the plant, necessitating a long haul of materials with a resulting higher cost of production.

The floor of the pit in the immediate vicinity had not been available by the shovel or crane methods and, for this reason, a Sauerman cableway was installed near the plant, dumping directly into the grizzly hopper which loads the plant elevator. The Bucyrus 2½-cu. yd. shovel will continue to operate in the west bank when the plant is operating to capacity output. The Bucyrus crane has been transferred to the plant stock-piles where it is equipped with a 1½-cu. yd. clamshell bucket for loading cars. This unit serves as a general utility machine, it having a 2-cu. yd. dipper as well as a dragline and clamshell buckets.

Raw materials from the cableway are dumped near the grizzly hopper, striking first a pile of gravel banked near the hopper to break the intensity of the fall. The material then avalanches into the hopper and is loaded into the main plant elevator by a 28-in. Jeffrey pan conveyor which acts as a plate feeder.

Material from the Bucyrus shovel is brought to the hopper in trains of Western cars drawn by a Davenport 18-ton locomotive or a Lima locomotive of similar size.

A 30-in. belt conveyor, 180 ft. long, transports the raw material to the crushing mill. Hewitt Gutta Percha Rubber Co. belting is employed on this conveyor. As the material is discharged from the head pulley it is directed by a baffle plate to a Simplicity 3-ft. by 6-ft. 3-deck vibrating screen, the top deck having 3½-in. square openings in a heavy punched plate and serving as a scalping screen. The middle deck has a 2⅛-in.-mesh wire screen and the lower a 1½-in.-mesh wire screen. The scalping screen unit serves a three-fold purpose. First, the top deck rejects boulders and rocks which are sent to the Austin No. 7 primary breaker to be converted into crushed stone; second, the second and third decks



Two-drum hoist on the slack-line cableway.

Plant view showing concrete-stave storage bins.

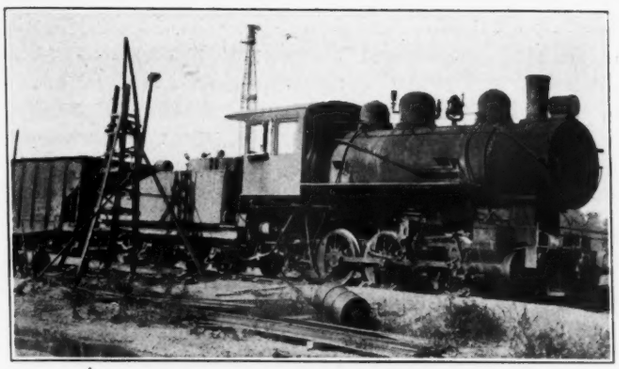
reject oversize gravel which is sent to Symons 36-in. and 24-in. disk crushers respectively, also to be converted into crushed stone; and third, the screen unit separates the sand and gravel from the larger size materials and transfers the throughs to a second vibrating screen unit located below it for classification.

Continuing with the crushed-stone branch of the plant, rocks and boulders are sent to the Austin crusher and the oversize gravel to the Symons disk crusher. Crushed material from the Austin unit is again sized in a 30-in. by 5-ft. rotary scalper with 2-in. perforations, the rejects of which pass to an Allis-Chalmers No. 5 crusher set at 2 in. All

crushed material from the Symons and Allis-Chalmers crushers and the throughs from the rotary screen are sent to the crushed-stone classifying screen, located in the top floor of the mill, by means of a 24-in. bucket elevator, 75 ft. long.

Two units of Simplicity screens classify the material into salable sizes. Each unit consists of two decks. The top deck of the first, which receives all the crushed stone from the elevator, has a 2¼-in.-mesh screen. Rejects from this screen are returned to the Symons 36-in. disk crusher. The second deck has a 1¼-in.-mesh screen and rejects from it are returned to a Symons 24-in. disk crusher.

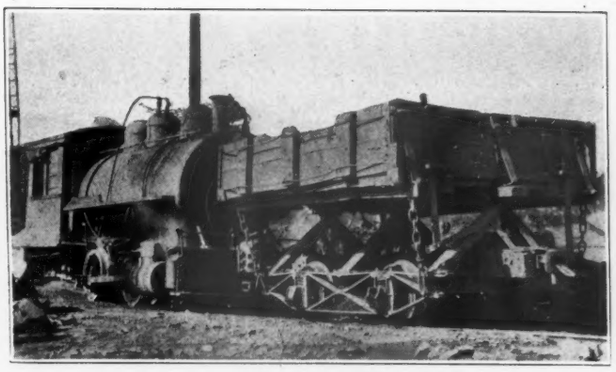
The second vibrating screen is mounted directly



Oil-burning locomotive used to move cars.

beneath the first unit, receiving the throughs, from the screen above, on its ⅞-in.-mesh top deck. Rejects from this screen pass to a bin as the first size of crushed stone. Throughs fall to the second deck having a ¼-in.-mesh screen, which rejects the ⅞-in. to ¼-in. material to a bin beneath and passes the screenings below ¼-in. in size to another bin.

Returning to the scalping screen for the sand-gravel branch of the plant we find that the throughs from the bottom deck fall to the top deck of a Simplicity 3-deck classifying and washing screen. Water from several pipe-line jets is sprayed on the material as it passes on each screen, insuring a clean and thoroughly washed product. The top deck produces the regulation concrete aggregate, 1-in. to 1½-in. in size, which is sent to the Neff & Fry bins on a 16-in. bucket elevator 56 ft. long. The elevator, driven by a 10-hp. motor, discharges to a conveyor which distributes the gravel to either of the two



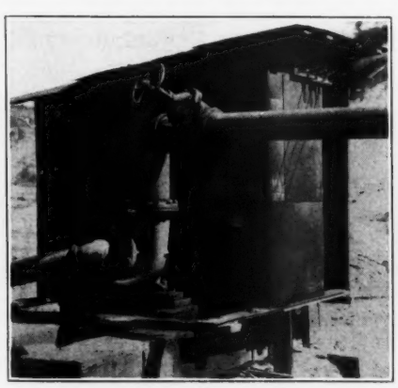
Locomotive and car which operate in the pit.

gravel bins. The conveyor is 36 ft. long and is driven by a 5-hp. motor.

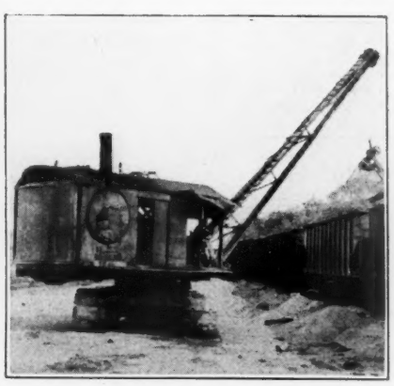
A smaller size gravel, ⅜-in. to 1-in. in size, is produced on the second deck of the screen, and is sent to a bin beneath. The third screen produces pea gravel which is stored in a bin and in stock-piles. Throughs from the bottom deck are flumed to the two wooden settling tanks. Two screens in the flume are employed to recover masons' and coarse concrete sand into their respective settling tanks beneath. These two tanks are 6 ft. by 4½ ft. by 5½ ft. deep.

The coarse-sand settling tank is placed over a larger tank equipped with a Columbus Conveyor Co. 24-ft. dewatering chain-drag which elevates the sand from the tank and deposits it in the conveyor which, in turn, transports it to the two sand silos. Each paddle on the drag-chain is a 24-in. length of 4-in. by 3⅛-in. angle iron. The chain is powered by a 5-hp. motor. Columbus Conveyor Co. idlers and pulleys with 20-in. Goodyear belting operated by a 5-hp. motor make up the sand conveyor equipment which distributes to either of two sand bins.

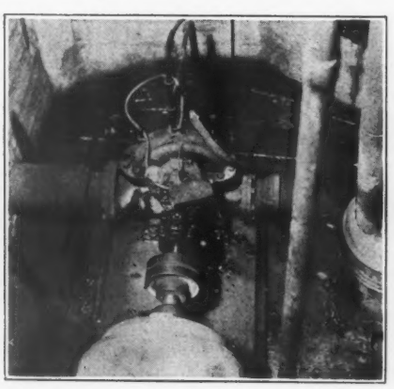
Water for the washing screens is furnished by two Goulds centrifugal pumps. One pump, a 10-in. by 8-in. unit, driven by a 100-hp. motor, is located at the roadside along the plant, within 50 ft. of the Little Miami River. It is in a dry sump about 15 ft. below ground level on a level with the river, with only a slight suction lift. A small stove offers frost protection in cold weather. An underground pipe-line carries the water to the plant. Another Goulds pump, a 6-in. unit, is placed on the shore of the cableway pond near the plant.



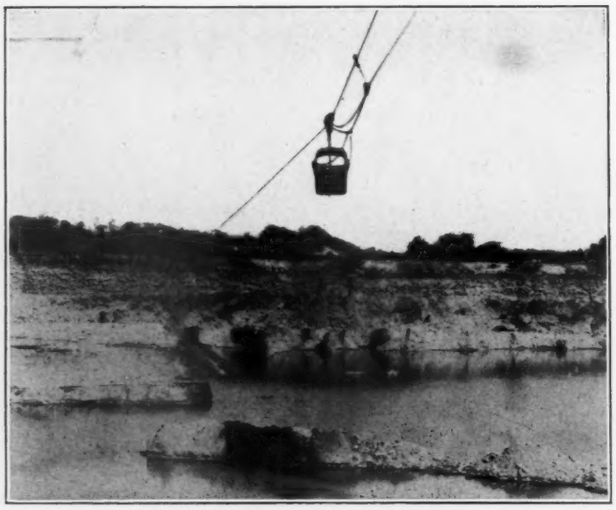
Pump which supplies washing water.



Steam shovel loading to cars.

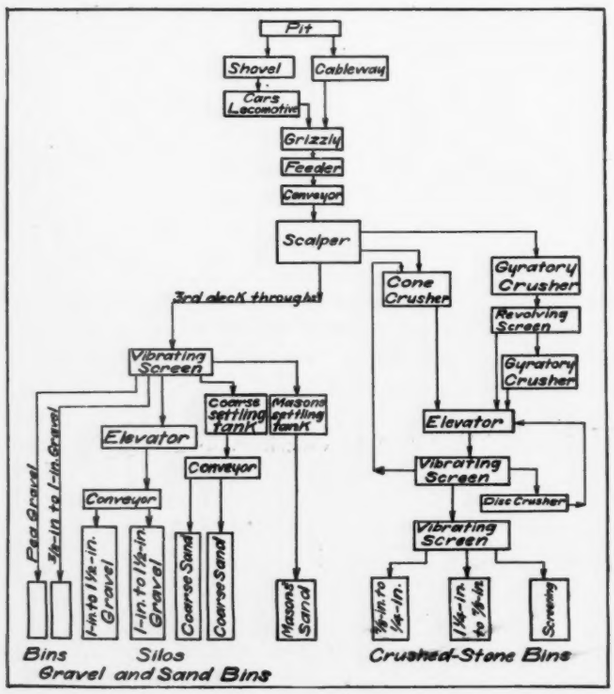


Pump operating in dry sump.



The 2-cu. yd. bucket en route to discharge point.

The Queen City company operates on a site of 70 acres, along the Pennsylvania R. R., about 14 miles from the heart of Cincinnati. The 3,000-ft. side-track provides ample carloading and storage capacity. A Porter 68-ton, oil-burning locomotive which played an important part in the construction of the Chicago, Milwaukee and North Shore R. R. Skokie Valley division, a few years ago, is now in



Flow-sheet of the Queen City operations.

the service of the Queen City company with switching and car-moving duties.

The company, now in its sixteenth year of operation, employs 22 men at the plant. Officers include: D. W. Craig, president; O. K. Jones, secretary; H. P. Lange, treasurer and general manager; and John Sontag, superintendent.

Properties, Uses and Various Grades of Asbestos Are Described

The high grades of asbestos differ from all other minerals in that they may be separated readily into fine, flexible, strong, silky fibers, according to Dr. Oliver Bowles and B. H. Stoddard in a report recently issued by the U. S. Bureau of Mines. Thus they possess qualities unknown to any other substance, for they may be spun into yarn or thread, woven into cloth, or felted into sheets or packings in the same way that a vegetable or animal fiber may be treated, but unlike cotton or wool they consist of non-combustible matter and are therefore fireproof, weatherproof, and highly resistant to chemical action.

In its commercial classification asbestos falls into two divisions, the spinning and the nonspinning fibers. Fiber of spinning quality is woven into various fabrics, the chief of which is that used for automobile brake-band linings. Other important uses for asbestos fabrics are clutch facings, packings, theater curtains, and fireproof suits and gloves. Grades of asbestos shorter than those used for spinning are used in compressed sheets, paper, and asbestos-cement shingles. On account of its heat-insulation and fire-resisting properties asbestos paper is used chiefly for the manufacture of 3-ply air cell and other types of pipe [illegible] sheeting between floors, and for lining [illegible] and filing cabinets. The shortest grades are used in asbestos cement, fireproof paints, packings, and insulating materials. There are many other uses. The highest grades of asbestos are known as crude fibers, which are hand cobbed and are not passed through crushers or mills. Crudes and the highest grade mill fiber provide material for spinning purposes.

Millstock is the product obtained by crushing the rock, passing it through beaters, and removing the fiber by screening and air separation. It is graded and classified according to length.

Association Studies Concrete-Making Properties of Aggregate

The program of study and investigation being conducted by the National Sand and Gravel Assn. includes the continuation of investigations previously begun on the concrete-making properties of sand and gravel aggregates, and the beginning of additional studies. Some of the items in the program are:

1. Effect of characteristics (other than grading) of coarse aggregates on the strength of concrete. This includes studies of mineral composition, surface texture, strength and shape of the particles.
2. Methods of testing the durability of aggregates and concrete.
3. Correlation of tests of sand with their concrete-making properties.
4. Studies of size and grading of aggregates, with particular reference to methods for proportioning fine and coarse sizes for concrete.

Production Capacity of Cement Plants Ample for Years to Come

By BLAINE S. SMITH
President, Pennsylvania-Dixie Cement Corp.

MANY of the ailments from which to-day's business is suffering might readily be traced to unwarranted and uneconomic increases in productive capacity in industries, too many new plants, or too many plant expansions without first having increasing demand definitely indicating the necessity for increased output.

The cement industry is an example of this condition. In 1922, the excess of capacity over shipments was 24.2 per cent. Had such a margin been maintained, it would probably have proved to be reasonable and adequate.

We find, however, that, between 1922 and 1930, production capacity was increased about 79 per cent, which, coupled with slightly decreased demand in 1929 and 1930, created a situation where capacity to produce was far in excess of demand, as evidenced by shipments. The Government reports show that, in 1930, excess capacity was 63.8 per cent for the country generally, and a breakdown by districts shows every one of them with large excess capacity.

In the face of such figures there would appear no justification for the organization of new companies to erect additional plants nor for expansion of existing plants. Either of such moves would be unsound in principle, harmful not only to the new investors but also to those already interested in existing companies, to allied industries founded to supply an imaginary demand, to the railroads, to labor, and finally to the communities themselves.

The foregoing summarizes the present situation. A look into the future might be interesting, so suppose we set up an optimistic picture of potential demand.

In 1921, shipments were 95,507,147 barrels, and in 1930, 158,790,000 barrels—an increase of 63,283,000 barrels in round figures.

For the purpose of speculation, let us add, to the 1930 figures, the 63,283,000 barrel increase thus indicated, on the assumption that the next ten years will show the same increase. We will then have an estimated demand, in 1940, for 222,000,000 barrels. Now, since 260,000,000 barrels can be produced by plants existing now, it is apparent that, for many years to come, the country's cement requirements can be amply served by these plants.

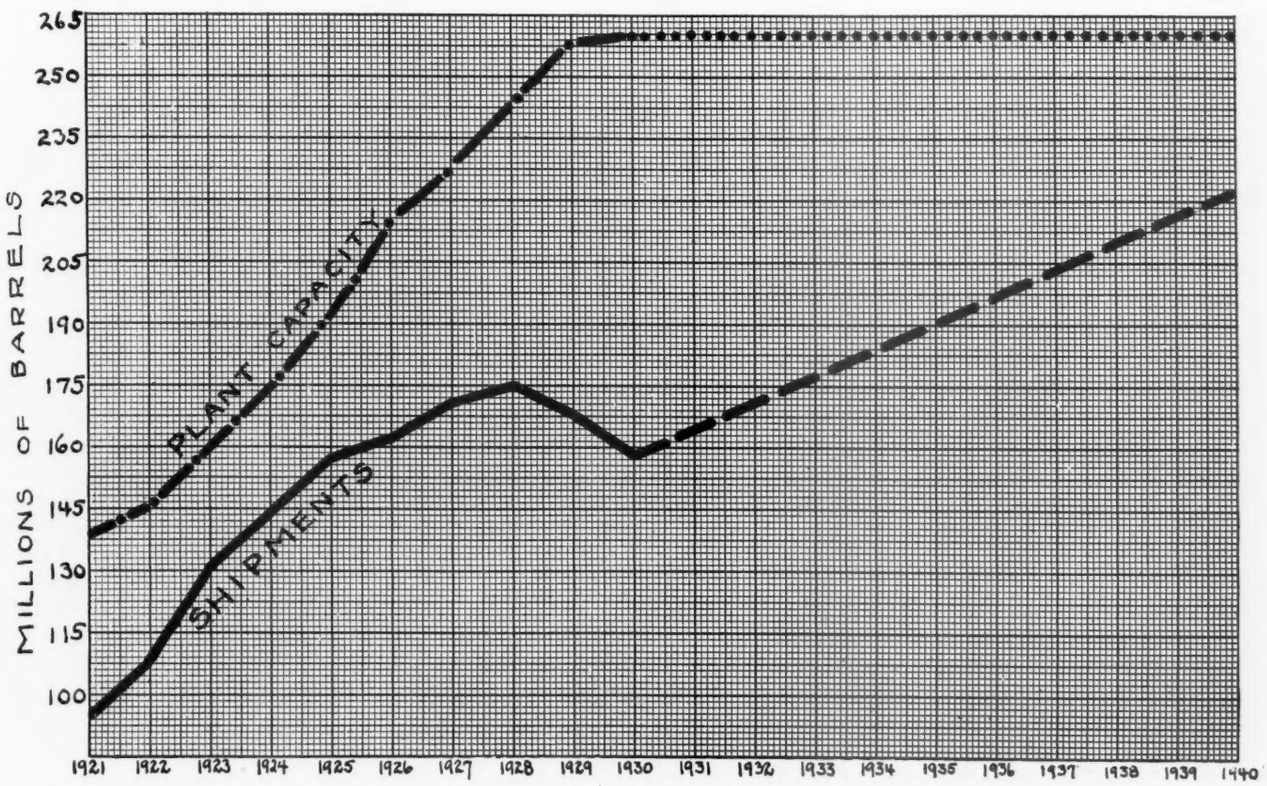


Chart showing production capacity and shipments of Portland cement from 1921 to 1930, inclusive; estimated average shipments by years, 1931-1940; and 1931-1940 production capacity if capacities of existing plants were to remain unchanged.

Governors Air Views on Current Plans for Construction of Highways

MANY state, city and county governments have already awarded contracts for 1931 highway and bridge construction, while other similar projects are pending with strong probability of becoming active within the next month or so.

There is a wide demand for the relief of unemployment in pushing projects of a public nature, and authorities are endeavoring to meet the situation as fully as is possible within their respective financial restrictions.

Of the $64,000,000 spent last year in Pennsylvania for highway and bridge construction, approximately 80 per cent or $51,200,000 went as wages to workmen. As many as 22,530 men were employed by the state highway department and contractors. Considering laborers who were provided work indirectly, some 30,000 men were necessary for the 1930 program of this one state.

Minnesota is considering a highway bond issue for $15,414,000. Its importance is realized when it is learned that, of this, $9,248,000 will go to labor over a two-year period. According to Jay T. Ellison, chief engineer of the Minnesota state highway department, this means jobs for more than 5,000 men.

Illinois, a state that has already won all-time honors in road building, will embark on her greatest construction program. Some $45,000,000 will be spent and some 50,000 men employed this year.

Whereas most of the considerations concerning highway construction center about the labor that is involved in the field work, the fact remains that these projects always consume the products of cement and aggregate plants in which many other workmen are employed; so that every stretch of road building is really of more than local significance in the prevalent economic situation. Furthermore the aspect is still broader in that it provides assurance of continued activities in many plants that would otherwise be closed down.

In the last message of nearly every state governor to his legislature there has been more or less discussion of highway construction and maintenance. The accompanying excerpts are selected because they bear upon the prospect for road construction this year in various sections.

Alabama

GOV. BIBBS GRAVES: I suggest for consideration the submission of an amendment authorizing issuance of road bonds to an amount within two limits; the first limit being that the total face value of all bonds issued shall not exceed eight times the amount of net annual revenue available for its amortization, provided that, when all of any series issued has been retired, that series shall be eliminated from this first limit; the second limit being that the total amount outstanding at any one time shall not exceed a fixed sum, say $100,000,000.

Arizona

GOV. GEO. W. HUNT: If the iniquitous Boulder Dam bill should be declared constitutional by the Supreme Court, I recommend to the Legislature that a road be constructed from Chloride to the dam.

Arkansas

GOV. HARVEY PARNELL: The state highway system has progressed far enough that I believe we should turn increasing attention to development of roads which will permit the farmers of this state to get to the state highway system and get full advantage of it. To this end, I am working on a plan for county-road development.

California

GOV. JAMES ROLPH, JR.: I believe we should continue our program of building and improving the state highway system and that the development should be carried out on a balanced program, in the sparsely settled mountain and desert areas as well as in the rich valley and urban regions. It is essential to the proper development of our state that a fair distribution of mileage commensurate with the funds available for this purpose be made. The development of our system either north or south is a benefit to the entire state. I am in accord with the principles laid down by the last Legislature in considering the addition of new highways to the state highway system, as this recognizes the lack of balance between the mileage of secondary roads in the south and in the north.

Colorado

GOV. W. H. ADAMS: Special efforts are being made toward the construction and maintenance of good roads. More work will be done during the current year than in any previous year and the work will be begun earlier and prosecuted more vigorously than ever before. This should be of material assistance in meeting our unemployment problem. Provision has been made to secure and use all Federal Aid road funds available to Colorado. The total funds available for road work in Colorado for the present year will reach nearly $10,000,000, all of which, it is hoped and expected, will be expended in an efficient, businesslike manner to the substantial advancement of the interests of our state.

Connecticut

GOV. WILBUR CROSS: The building of the trunk-line system and state-aid roads has progressed rapidly during the last decade. There are, however, still several congested sections. A most pressing need is a comprehensive plan for the building and the improvement of rural roads. The time has come, in popular phrase, "to take the farmer out of the mud." During the winter months many of the rural roads are impassable by automobile and very few of them are ordinarily in good condition. The ideal towards which we should strive is a complete network of good roads from all villages and outlying

districts, tied in with the state roads and trunk lines, so that all parts of the state may be readily accessible to farmers and city dwellers alike.

Delaware

GOV. C. DOUGLASS BUCK: I suggest the state extend to each county the opportunity to consolidate its road work; the state highway department to retain as much of the county engineering organizations as it can profitably use and the counties to reduce by 25 per cent their present assessments for road purposes; the moneys collected at the revised rate to be paid to the state treasurer for the use of the state highway department.

Illinois

GOV. L. L. EMMERSON: There remain approximately 2,200 miles of the bond-issue system yet to complete. The cost of completing this mileage, together with necessary widenings, grade separations with railroads, highway grade separations and large bridges across the Illinois River, will be approximately $110,000,000.

If the present sources of revenue are left undisturbed, sufficient funds will be collected to complete practically all the work within the next three years.

Indiana

GOV. HARRY LESLIE: Highway construction is estimated and based upon yearly receipts from the gasoline and other special taxes and fees. The Highway Commission necessarily plans for construction a year in advance and lets contracts on that basis. It is easy to see that any diversion or depletion of the regular highway construction and maintenance funds must destroy the road program, disrupt the organization, slow down the good-roads movement and hamper a service which is making itself indispensable and which is urgently demanded by the public. All moneys collected as gasoline taxes and automobile license fees should be expended upon our roads in justice to the public.

Iowa

GOV. DAN TURNER: Iowa has taken a leading place among the states of the Union in the important work of designing and constructing a statewide system of good roads. This road-building program has been determined by our people and can now be considered a settled policy of the state. We should continue with that work in as expeditious a manner as is consistent with good business and sound financing.

Kansas

GOV. HARRY WOODRING: The people of Kansas were assured that the state would institute and push to conclusion a system of all-weather roads. Only half of the system is completed. We must continue the construction of some hard-surfaced roads to close gaps and take care of special conditions where the heavy traffic makes the cost of maintaining and resurfacing the present roads prohibitive.

Maine

GOV. WM. T. GARDINER: We have spent and are spending sums of money for good roads that are large in comparison to our resources, but good roads are a matter of vital concern to the state and we have a vast territory to cover. If our work is wisely planned and economically executed there should be no objection to the continuance of the work on a large scale.

Maryland

GOV. ALBERT RITCHIE: In the past, state bonds have been issued each year to match the Federal aid received from the Government. The normal increase, however, in the receipts from automobile licenses and gasoline taxes justifies, I think, a change in this method of financing, and I am now recommending that the above Federal aid be matched each year from the license fees and gasoline taxes. This will relieve the general taxpayers of the state of a bond issue of $1,052,000 each year and will place the cost of matching the Federal road money upon those who use the roads.

Michigan

GOV. W. M. BRUCKER: Development of this transportation system must take place with that continuity of purpose which is only possible through a stable, centralized, state agency. It is a recognized duty of the wealthier and more populous communities to share in the cost of highway service to the less fortunate areas whose highway problems are so largely created by traffic from without their borders. If these wealthier communities must pay for this service then their needs must be given consideration and a system created which is not wholly local in benefit.

Montana

GOV. J. E. ERICKSON: The last Congress made largely increased appropriations for highway purposes. Under authorizations up to 1933, Montana will have available $2,500,000 of Federal aid per year instead of $1,500,000 per year as heretofore, provided we are able to match the Government money with local funds. A surplus has now accumulated to the credit of Montana amounting to more than $6,000,000. I can not conceive that this state will consider for a single moment neglecting to use this Federal assistance.

Nebraska

GOV. CHAS. W. BRYAN: The state is fortunate in having a much larger sum available for road building for the coming biennium than ever before.

Nevada

GOV. FRED B. BALZAR: Inasmuch as there is immediate need for a far-reaching and comprehensive highway program for the coming two years to relieve the unemployment situation, as well as to use the federal aid available for highway improvements, I recommend that all revenues derived from the motor-vehicle license fees and the gasoline tax be used for the completion and maintenance of our federal-aid and state highway system, and that no diversion of these funds be made for other purposes. In connection therewith, I further recommend that a state highway bond issue of $600,000 be authorized and used in the construction of the highway connections previously mentioned.

New York

GOV. FRANKLIN D. ROOSEVELT: Construction and maintenance of the state and county highway sys-

tems proceed at a faster pace than ever before, and in my budget I am asking for still larger appropriations. I am also asking that a large part of the funds be made immediately available in order that much of the work may be started this winter, so as to anticipate the employment of thousands of additional workers.

North Dakota

GOV. GEORGE F. SHAFER: I am sure the people of North Dakota desire that highway construction shall proceed without interruption until the system is completed. If this is to be done, how shall new construction work be financed? In my judgment, the proper way to solve the problem is to provide an increase in highway revenues on motor traffic entirely, and to that end I advise the following legislation:

First: Raise the state gasoline tax by 1 cent per gallon, the collection to go to the state highway construction fund after deducting the usual refunds for gasoline used in tractors and stationary engines.

Second: Provide a moderate increase in motor-vehicle registration fees.

Third: Correct, if possible, the defects in the present system of allowing refunds, in order to reduce the frauds that it seems certain are being practiced against the state, and thus save to the state a larger share of gasoline-tax collections.

Ohio

GOV. GEO. WHITE: I recommend, that a secondary system of state highways be organized to include all local roads which have sufficient traffic to justify the highway department in including them in this system, thus enabling county and township officials to extend the improvements into remoter sections and getting more of our rural population out of the mud.

Oregon

GOV. JULIUS MEIR: I favor a continuance of our highway program along practical and sound lines, with liberal consideration for our present unemployment situation, which it will be my most earnest endeavor to relieve.

I recommend, for early passage, legislation allowing the construction of highway improvements such as tunnels, roads and bridges by the utility certificate method. This plan has been successfully employed for years in other states. It will bring to Oregon outside capital with which major highway improvements can be built and paid for with the income from the utility only, and when so constructed and paid for in full will become the property of the state without any additional taxation or bonding of the state.

Pennsylvania

GOV. GIFFORD PINCHOT: For lack of a logical plan of improvement, the township highways have grown into an irregular and disconnected system. That condition is thoroughly unsatisfactory. In place of it there should be substituted a planned and orderly system of inter-county and inter-township roads.

South Dakota

GOV. WARREN E. GREEN: I am not opposed to paving where needed, but feel that it should be rigidly confined for the time being to short sections where paving is undeniably less costly than other types of highway construction, maintenance costs considered. And I would further limit this construction to such mileage as we can comfortably finance without injustice to other sections and other groups equally deserving. I would recommend that greater attention be directed henceforth to farm-to-market roads.

Tennessee

GOV. HENRY HORTON: The improved road facilities that we have are saving their users far more per year than they are costing them. The state has borrowed on short-term notes and used in the construction and maintenance of the present system of roads the sum of $47,200,000. This is one of the state's outstanding obligations and is being retired by the revenues of the gasoline tax. If the system is ever to be completed, is there a more opportune time than now? Materials and labor are cheaper at this time than they have been within the past decade. People are needing the work, and money is not high. The gasoline tax is taking care of road construction, maintenance, interest and sinking fund of road notes, and will continue to do so.

West Virginia

GOV. WM. G. CONLEY: It is believed that the Legislature could authorize the reissue of possibly $10,000,000 of state road bonds, as retired. Some $4,000,000 of these reissued bonds could be sold to finance the 1932 program, and this, together with federal aid and a possible surplus from revenues, would provide for a small amount of new construction. For 1933, the state will not be in position to accept its federal aid unless some action be taken. If the present Legislature should decide to submit another bond issue to the people to be voted upon in November, 1932, the authorization of such a bond issue would provide the needed funds to match federal aid and to continue an aggressive program.

Wyoming

GOV. FRANK EMERSON: While good progress has been made upon the construction of the state highway system during the past two years, the next two years will see a greatly enlarged program, which will bring all highways on the main system near completion with entire completion the third year assured. The passage of the road bond issue in the amount of $2,800,000 at the time of the recent general election has been most helpful, for the funds available thereby will allow the state to match, in full, the larger amounts of federal aid now provided by the United States. Between state and federal funds, an amount of about $4,683,000 will be provided for construction during the year 1931. This amount is in contrast with the construction fund of about $1,900,000 for the year 1930. Not only will the increased funds allow rapid closing of the existing unimproved stretches upon the main highways, but the expenditure of the larger funds will mean increased employment of labor and the circulation of much additional money in channels of business and trade.

Panorama of the Morton operation. Pipe-lines on pontoon and two dredges, right. Sumps and shovel, left center. Track hopper at extreme left.

Illinois Gravel Producer Installs New Electrically-Operated Dredge

New Equipment Designed to Transport Material Over a 1,200-Foot Pipe-Line

THE commercial production of sand and gravel is what economists term a depleting industry: the source of the raw material is never replenished. This is true of all sorts of mineral production and is proved, in the present instance, by the operations of the Morton Sand & Gravel Co., near Wayne, Ill. The July 4, 1928, issue of PIT AND QUARRY contained a full description of the then brand-new plant of this company.

The operations involve dredging, the transport of the gravel by a pipe-line, and the washing and screening of the raw material in a shore structure atop the storage silos.

The Morris Machine Works of Baldwinsville, N. Y., furnished all the dredging equipment, comprising a 12-in. centrifugal pump as the main unit and a 3-in. centrifugal unit for priming. These pumps are operated by General Electric motors of 300-hp. and 10-hp. respectively. The suction line is raised and lowered by a three-drum Flory hoist driven by a 40-hp. General Electric motor.

This equipment has given complete satisfaction and is credited with having handled more than 750,000 tons of gravel during the two seasons that it has been in service. However, the dredging pond has grown to such dimensions that the pipe-line has become prohibitively long for the dredge pump. This situation called for serious consideration, the result of which has been the erection of a second Morris-equipped dredge, designed to operate efficiently to the limit of a 1,200-ft. pipe-line radius. This limitation is believed, by Joy Morton II, general superintendent, to represent the maximum distance that the excavated materials in this deposit can be handled economically by a pipe-line.

The hull of the new dredge is a steel barge, 24 ft. wide, 60 ft. long and 6 ft. deep, built as two longitudinal sections bolted together. The main pump is a Morris 12-in. centrifugal, driven by a 300-hp. General Electric motor and rated at 4,000 gal. per min. The primer is a Morris 233-A centrifugal pump driven by a General Electric 10-hp. motor.

A view of the new dredge showing revolving cutter head.

The 12-in. dredge pump, driven by a 300-hp. motor.

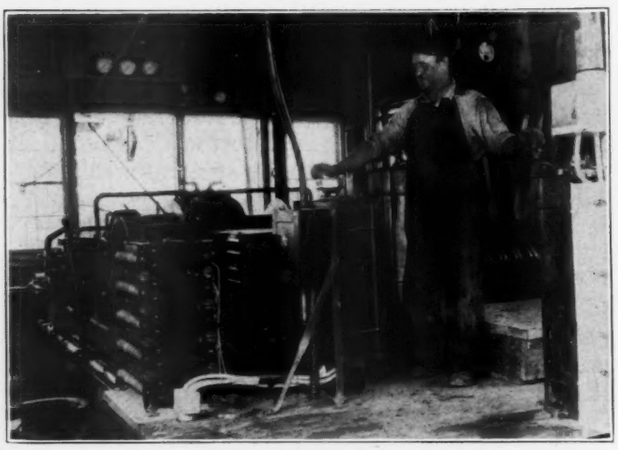
The suction boom is handled by a three-drum hoist powered by a General Electric 45-hp. motor. A Morris rotary agitator is mounted at the outer end of this boom and is driven, through a long shaft, by a 25-hp. motor mounted on the inboard end of the boom. Capstans on the main hoist are used in moving the barge.

Electric power is brought aboard the dredge through a Rome Wire Works rubber-covered four-lead cable, supported by steel drums which serve as pontoons. One lead in the cable is a ground line that is connected ashore.

The pipe-line radius will range from 600 ft. to the 1,200 ft. that, as said, is set as the ultimate. It is made up of 30-ft. lengths of 12-in. spiral-steel pipe, connected by flexible joints. All bends in the line are gradual to minimize the frictional resistances and the wear of the pipe. It has been found that the straight sections of the pipe-line wear almost twice as long as do ordinary bends. The average life of bends is one season whereas straightaway lengths in the pipe-line will last, sometimes, two seasons.

The line is supported on pontoons that are provided, as needed, by lashing steel drums to wooden frames. A flop gate in the line can be closed when pumping ceases to obviate the complete refilling of the pipe when priming is resumed.

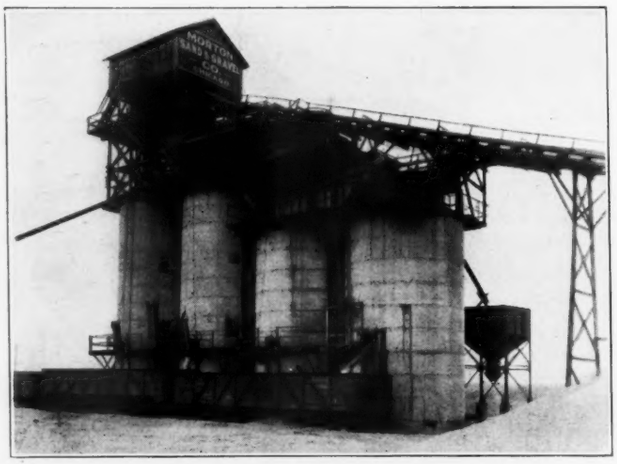
No changes of significance have been made in the shore plant. The pipe-line from the dredge is forked and discharges the gravel into either of two kidney-



Operator at controls aboard the dredge.

shaped drainage sumps which have an outside radius of about 50 ft. and an inner radius of 20 ft. as measured from the position of a shovel in the circular space between the sumps. The sumps are constructed of wood and have adjustable weir-gates for regulating the overflow. This simple arrangement, while retaining the desirable gravel and sand, really furnishes an initial washing.

The gravel, after its dewatering and first washing in either sump, is handled by a Bucyrus 50B electric shovel with a 60-ft. boom, a 2-cu. yd. clam-shell bucket and a crawler mounting, into an 18-ft. concrete receiving hopper covered by a grizzly. Material is withdrawn from this hopper through a Stephens-Adamson rock-and-pinion slide-gate in the bottom directly to a Stephens-Adamson 30-in. belt conveyor with Simplex carriers and return rollers. From this conveyor the material drops to a second belt conveyor and proceeds to the scalping screen which is 12 ft. long and 48 in. in diam. The 2¼-in. oversize from this screen drops into an Allis-Chalmers 6K gyratory crusher to be again screened while the throughs pass to a third 30-in. belt conveyor and are carried about 200 ft. to the main screening and washing building which has a dual



The screening and washing plant above the four storage silos.

layout. The screens, all Gilberts, are mounted in three pairs, so arranged that they prepare products for the respective silos located below.

Each of the four silos is 22 ft. in diameter. Two of them are 47 ft. high, the other two 43 ft. As said, the shore plant has not been altered and will continue in service indefinitely.

Tests Being Made on Waterproofing Agents for Concrete

Tests of a number of commercial products sold as waterproofers of concrete are nearing completion at the U. S. Bureau of Standards.

These tests include examination of fifty integral and fifty surface-applied materials. The integral waterproofing compounds have been incorporated in a 1:3:6 mixture of concrete. The test specimens were subjected to a water pressure of 20 lb. continuously for one year, and the amounts of water passing through the specimen per minute have been recorded at regular intervals. Concrete of the same character, but containing no waterproofing material has been tested in the same manner, thus giving a measure of the comparative impermeability of the various materials. Strength tests were also made.

The surface-applied waterproofing materials were applied to 3-in. by 6-in. cylinders made from a 1:2:4 mixture, after the cylinders had been cured for 28 days and then dried to constant weight. After the surface coatings were applied the cylinders were totally immersed in water, and were then weighed at regular intervals during the year. The weights of water absorbed were recorded. A complete report is being prepared for publication.

Pennsylvania Stone Producers Convene; New Size of Ballast Added

THE Pennsylvania Stone Producers Assn. held its annual meeting, March 13, at the Penn-Harris Hotel, Harrisburg, Pa. Pres. F. T. Gucker called the session to order at 1:30 p. m. After the reading of minutes and reports by the secretary-treasurer, officers were elected for the ensuing year. No ballots were required as the secretary was instructed to cast a unanimous vote for each nominee. The election resulted as follows:

President, F. O. Earnshaw, Carbon Limestone Co.; vice-president, S. W. Stauffer, J. E. Baker Co.; and secretary-treasurer, P. B. Reinhold, Reinhold & Co., Inc.

Mr. Reinhold succeeds himself in office. Upon assuming his new duties in the chair, Pres. Earnshaw called upon M. L. Jacobs, manager of the Bethlehem Mines Corp., as chairman of the specifications committee, to present the Dept. of Highway specifications for 1931. This Mr. Jacobs did, reporting that a new size of ballast—No. 5 A—has been added to the list of specifications and will be used during 1931 on the cheaper water-bound-macadam highways. The new size ranges in size from 1¼ in. to 2¾ in.

As chairman of the committee on surety bonds, Mr. Jacobs next reported his attendance, recently, at a joint session in Harrisburg when the subject was discussed fully with all the interested aggregates and materials producers. A bill covering this item has been prepared and submitted to the state legislature for definite decision. The secretary announced that he would provide each member of the Association with a copy of the bill, upon request. The members next had the pleasure of listening to a discussion of the bond situation by H. H. Wilson, a member of the Association and chairman of the Pennsylvania Constructors Assn. He made clear numerous important phases of the bonding problems in which the materials producers and the contractors are concerned mutually.

Mr. Wilson then suggested that the Association take up for serious consideration, the credit-bureau system of regulating credit relations, and base the functioning of the body along the lines of the present credit bureau in Detroit. The president will appoint a committee to make a study of the situation.

William M. Andrews, treasurer of the Lake Erie Limestone Co., Youngstown, O., had just returned from an executive meeting of the National Crushed Stone Association in Washington, D. C. He reviewed the engineering program as outlined by Mr. Goldbeck and the importance of the Pennsylvania producers in giving financial backing to this work. The program is extensive and will be discussed at greater length in the near future.

The president next read a letter of January 21, 1931, from Mr. Jacobs, regarding the advisability of having Governor Pinchot re-establish the safety work of the quarry section and bringing it under the Bureau of Mines. The president appointed a committee to investigate this question and to report at the earliest possible date, the committee comprising M. L. Jacobs, W. W. Duff and A. L. Sheffer.

As chairman of the uniform sales-contract committee, Mr. Andrews reported that he had completed his work and had submitted a form of contract which has been accepted by the Association as incorporating all the essential elements effecting sales and shipments. Mr. Andrews moved that 5,000 copies of the contract be printed at Association expense and at least 100 be sent to each of the members. The motion carried.

The secretary had invited Hon. S. S. Lewis, Secretary of Highways, to be the luncheon guest but, owing to changes in his plans, it was impossible for him to attend. The president appointed Messrs. Stauffer, Sheffer, Jacobs, Andrews and Reinhold as a committee to call upon Mr. Lewis in the afternoon. Mr. Lewis has a firm grasp on highways matters and will have as large a program as funds will permit. Approximately 240 miles of macadam will be advertised in the immediate future and, with all funds of various natures, it should permit the department to build about 1,000 miles of highways during 1931. A fair proportion of this will be of cheap construction.

The following were present at the meeting:

F. T. Gucker, Pres., John T. Dyer Co., Norristown, Pa.
Wm. M. Andrews, Treas., Lake Erie Limestone Co., Youngstown, O.
H. J. Filer, Pres., Grove City Limestone Co., Sharon, Pa.
F. W. Cramer, Pres., York Valley Lime & S. Co., York, Pa.
C. C. Hartsook, Man., Lime Bluff Co., Muncy, Pa.
Roy A. Yerger, Berks Products Corp., Reading, Pa.
A. G. Barres, Dist. Sales Man., General Crushed S. Co., Wilkes-Barre, Pa.
H. H. Wilson, Harrisburg, Pa.
S. W. Stauffer, Vice-Pres., J. E. Baker Co., York, Pa.
M. L. Jacobs, Man., Bethlehem Mines Corp., Bethlehem, Pa.
John Rice, Jr., General Crushed Stone Co., Easton, Pa.
G. D. Fraurfelder, Easton Car Co.
W. W. Duff, New Castle Lime & Stone Co., Lowellville, O.
D. H. Wendel, New Castle Lime & Stone Co., Johnstown, Pa.
H. E. Nauss, Steacy & Wilton Co., Wrightsville, Pa.
F. M. Wilton, Steacy & Wilton Co., Wrightsville, Pa.
A. J. O'Neill, Philadelphia, Pa.
W. L. Comer, Berwyn, Pa.
R. K. Kibblehouse, Ambler, Pa.
W. D. Nice, Harleysville, Pa.
H. B. Allen, Dist. Sales Mgr., General Crushed S. Co., Philadelphia, Pa.
E. T. Wolf, Dupont Co., Narbeth, Pa.
A. L. Sheffer, Pres., National Limestone Co., Naginey, Pa.
N. Cascetti, Pres., Stowe Trap Rock Co., Philadelphia, Pa.
F. O. Earnshaw, Pres., The Carbon Limestone Co., Youngstown, O.
P. B. Reinhold, Secy.-Treas., Reinhold & Co., Inc., Pittsburgh, Pa.

Ohio River Sand Co. Methods and Cost of Dredging Sand and Gravel*

By J. HAMILTON DUFFY

THE Ohio River Sand Co. operates two ladder-type dredges in recovering sand and gravel from the bed of the Ohio River in the vicinity of Louisville, Ky.

An industry which may be considered as the forerunner of the river sand-and-gravel business in that vicinity was the collection of paving boulders from the shallow parts of the river prior to 1875. These boulders were gathered by men wading the river and scooping them up by means of forks. The boulders were loaded into skiffs and poled or rowed to shore where they were transferred to wagons for delivery in Louisville for paving.

In 1875, J. T. Duffy installed a derrick boat equipped with a clamshell bucket. This was essentially a wooden hull on which was mounted a derrick with its steam boiler and hoist. By means of the clamshell bucket operated by the derrick, sand and gravel were dug from the river bottom and dropped into a hopper on the derrick boat. This hopper fed directly to a short trommel with a ¼- to ½-in.-mesh screen. The sand passed through the screen and was spouted to a wooden barge moored alongside. The coarse material or gravel was discharged back into the river as a waste product. The sand was then towed to Louisville by steam tow boats where it was unloaded by hand into wagons for delivery to the glass furnaces.

As the market for river products increased, Mr. Duffy, with Paul C. Barth and James Settle, organized the Ohio River Sand Co. This company in its early years had nothing to do with the production end of the business but confined its activities to selling and distributing the material supplied by Mr. Duffy. In 1906, however, the company took over the entire operation and has continued to the present time.

In 1904 the old derrick boat and clamshell were replaced by a dredge equipped with a centrifugal pump. This equipment was in turn replaced in 1924 with a modern ladder-type dredge to which a second unit or dredge was added in 1928. Both of these dredges are now in operation.

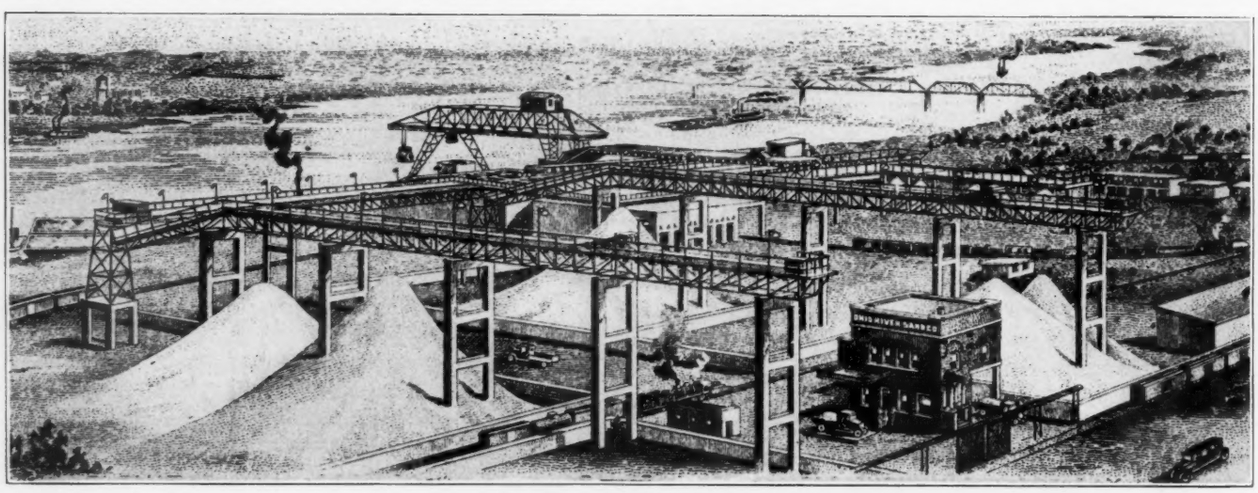
The first production of commercial gravel dates from 1904. With the derrick boat and barges unloaded by hand the company produced an average of 100 cu. yd. daily which was sold at a price of 90 cents, delivered anywhere in the city of Louisville.

As business increased a stiff-leg derrick was erected on the river bank, replacing the hand labor in unloading the barges. The derrick handled the sand and gravel up from the barges and dropped it into a hopper on the bank from which it passed by gravity to wagons. With this equipment the plant capacity was increased to 450 cu. yd. daily.

In 1907 the stiff-leg derrick on the river bank was replaced with a clamshell dredge. This unloaded the material into a hopper on a barge moored to the river bank. A flexible bridge and track connected this barge with an incline on shore. Wooden and steel cars now replaced the wagons and the gravel was hoisted up the incline and over a trestle to be dumped to storage piles on shore. Production was thus increased to 1,000 cu. yd. daily.

In 1923 the present land method of handling material was installed. Briefly, it consists of a Brownhoist bridge crane and system of elevated conveyor belts delivering to truck hoppers, railway cars, or storage piles. The unloading crane is equipped with a 3-cu. yd. clamshell bucket and there are 1,500 feet of conveyors. The railway sidings have a capacity of 35 cars. There is room for storing 150,000 tons of material behind concrete retain-

*Reprinted from U. S. Bureau of Mines Information Circular 6421.



Shore plant and storage yard of the Ohio River Sand Co.

ing walls and the loading hoppers have an additional capacity of 5,000 tons.

In 1915 all wagon hauling for city delivery was replaced by auto trucks and, in 1926, all wooden river equipment was replaced by steel. The present capacity of the plant is 350 tons per hour.

The gravel deposits present the familiar characteristics of river-bar geology. Both sand and gravel have been carried down the river for centuries. Flood stages in spring and fall have brought in vast quantities of fresh material to be sorted and deposited according to the vagaries of the changing currents. Thus, heavy coarse gravel is found at points of rapid current and fine sand and mud where the velocity of the current diminishes. Constant changes occurring in the direction and velocity of the currents cause the previously formed bars to be reworked and as a consequence coarse and fine gravel is found intimately mixed with large volumes of fine sand.

Formerly many of these bars were above low-water level and could be prospected and tested by dry-land methods. With the recent completion of the Federal system of dams a minimum water level is maintained which inundates practically all the river bars. At many points boulders ranging in weight from 10 lb. to 300 lb. are found scattered over the river bed and imbedded in the gravel.

The commercial gravel deposits vary greatly both in depth and area. In a distance of 100 feet laterally a good, coarse gravel deposit may change to a bar of fine sand.

In addition to the underwater deposits operated by the company it owns two islands in the river. These islands have been tested by churn drilling and the gravel beds contained in them have been shown to vary considerably. The gravel itself varies from 20 to 50 ft. in vertical thickness and is overlaid with from 5 to 20 ft. of sand. This in turn is covered with 5 to 20 ft. of silt, or river mud. The larger of these islands comprises 225 acres and is estimated to contain over 16,000,000 tons of sand and gravel.

Within the gravel beds on the islands is a stratum of heavy blue clay from 12 to 18 in. thick. This clay stratum causes trouble in that when dug up with the gravel it does not disintegrate but forms clay balls which are difficult to separate from the gravel.

At present the recovery of gravel is complicated by the condition of the river bottom as left by former dredging operations. The formerly-used clamshell and pump dredges excavated shallower holes than the present type of ladder dredge. Pump sections, as they dug, cut inverted conical openings in the bottom with tops, widening as the pump went deeper. This caused caving and, as the sides caved, an increasing number of boulders collected at the suction intake. This accumulation finally blocked the suction and the dredge was forced to move. This meant the gravel was recovered from a series of holes which in most cases did not extend to the bottom of the gravel. Much of the present dredging is over this uneven bottom from which the commercial material has been only partially removed. These holes have also been more or less filled by river mud and other debris depending on the length of time since they were dug.

Where undisturbed the upper 8 to 10 ft. of a gravel bed will usually be found to contain 50 per cent sand and 50 per cent gravel while that below will be more apt to run 75 per cent sand and 25 per cent gravel.

The ladder type of dredge was adopted because it afforded a means of recovering a maximum of gravel with a single passage over the bar. It will also operate with less delay in bottoms that have been worked over by other types of dredges. A further reason for the choice of the ladder type over the centrifugal-pump dredge is its more economical use of power. The centrifugal pump must handle from 80 to 90 per cent water with only 10 to 20 per cent solids in its delivery. This means the expenditure of a large quantity of power for moving water, which is immediately discharged to the river again. In hard-bedded gravel the gravel must often be broken up ahead of the suction by means of a cutter head. This requires further power. The ladder buckets do not require any prior cutting of the bank and deliver the gravel with a minimum of water, thus allowing the power to be expended directly for the recovery of gravel without excessive waste.

This type of dredge is necessarily of larger size and requires much larger capital investment. On the other hand the capital investment per ton of productive capacity is probably on a par with other types of dredges, while the power expenditure and labor cost per ton of material recovered are less.

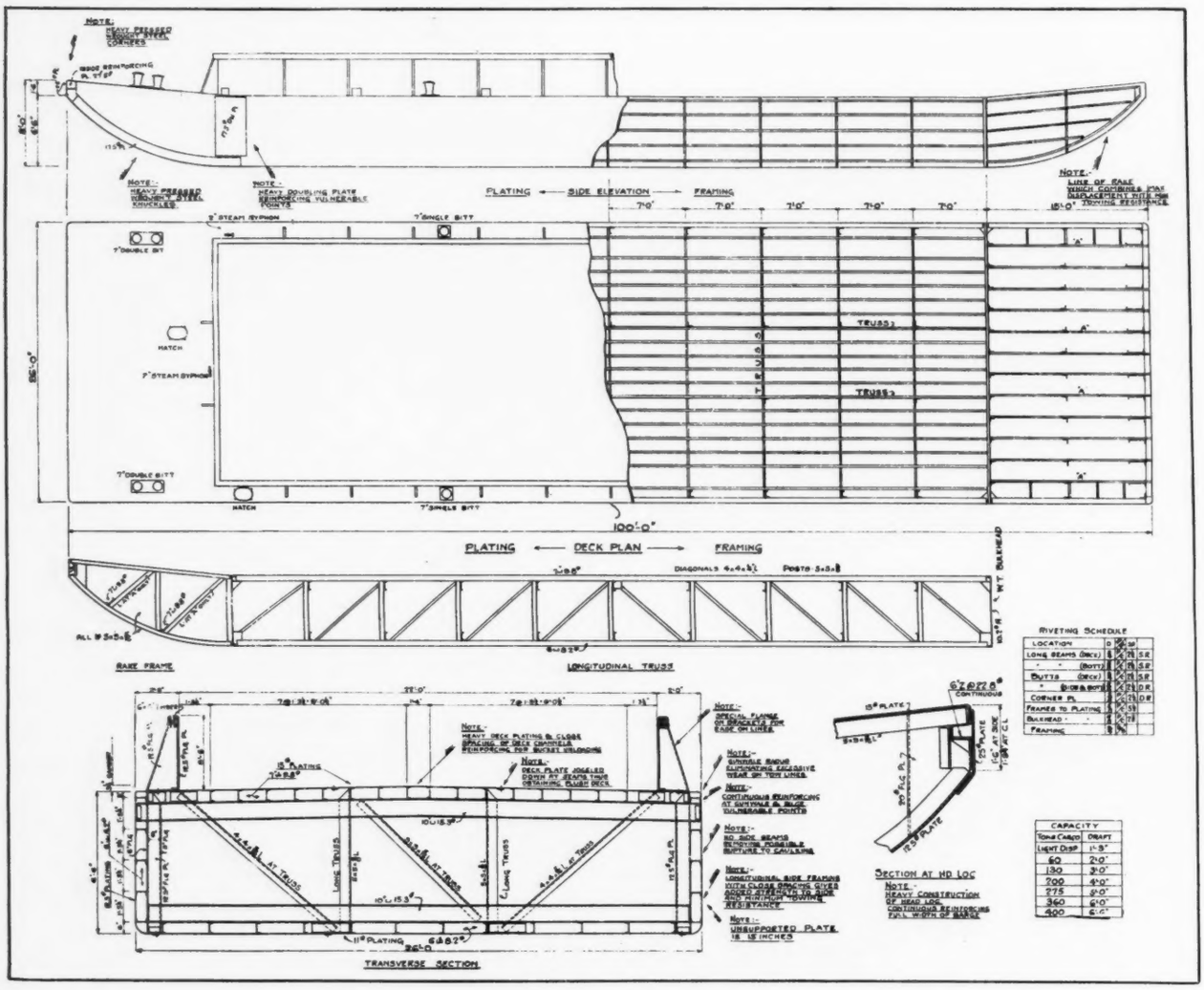
Because of the erratic and constantly changing characteristics of the gravel beds, prospecting in advance of actual digging has been of little use. A locality prospected one year and found to contain a bed of good gravel may later be covered with such an accumulation of drift and debris as to make it unworkable, or the gravel may have been removed by changing river currents. Where deposits can be reached above water level they are prospected by churn drills.

The usual practice in examining the river bottom is to sound with iron bars or pipes. By this method the operator can obtain some idea of the depth of silt or fine sand overlying the gravel or the presence of gravel itself on the river bottom.

Final prospecting, however, is done by setting a dredge over the location and actually digging. The material dug is examined for quality and ratio of sand to gravel. If not of commercial grade the dredge is moved to another locality.

Sampling of deposits is not practiced except by visual examination of the material as brought up by the dredge buckets. Marketable material is sampled and sent to customers for test as required.

Since all the gravel bars lie below water level and are erratic in both area and depth, the only practical method of operation is some form of dredging. Since gravel seldom extends more than



Transverse and longitudinal sections, deck plan and framing details of steel barge.

55 ft. below the water level the dredges were designed to operate at this maximum depth. The dredges are designed and constructed to form complete, floating, washing and screening plants although no provision is made on them for storage of finished material. In addition they are provided with living quarters for their crews.

In brief, the method of operation is to dig the gravel by a rigid ladder or continuous-bucket elevator. This discharges the material as dug into a hopper in which it is mixed with a sufficient quantity of wash water. It then passes to revolving screens where the sand and larger boulders are removed. The boulders are discharged through chutes into the river and the sand and gravel go to separate sumps or tanks. From the sumps the gravel is raised by bucket elevators to discharge over a series of sizing screens of such aperture as the markets require. After passing these screens the gravel is discharged through chutes or on conveyor belts to barges moored alongside the dredge. The sand is picked up from its sump by a second elevator and discharged to barges on the opposite side of the dredge or wasted to the river as market requirements demand. When the barges are loaded they are towed by river steamers to the storage plant on the river bank at Louisville.

The gravel is partly washed in the digging operation. Washing continues through all the screening operations so that, when discharged to the barges, all silt and mud have been removed. This silt and mud passes back to the river with the excess wash water. No further sizing is practiced at the storage plant in Louisville.

The older dredge, designated as the No. 4 digger, is a steel-hulled ladder-type dredge designed and built by the Dravo Contracting Co. of Pittsburgh, Pa.

The digging mechanism consists of an endless bucket elevator in which the buckets themselves form the links of the chain. This elevator is mounted on a heavy, rigid structural-steel frame hinged at the upper or discharge end and working through the center line of the hull. The lower or digging end is raised and lowered at the will of the dredge operator by means of multiple blocks and cable operating through a steam-driven hoist on the main deck. The operator's station is placed so he has an unobstructed view of the ascending buckets. When digging is interrupted by the buck-

ets encountering heavy debris, such as sunken tree trunks, the operator can raise or lower the ladder by simple manipulation of the control levers.

The buckets discharge into a steel hopper supported by the steel superstructure, and the gravel is fed by gravity to a revolving screen having 2¼-in. round openings. Surrounding the screen is a jacket with ⅛-in. openings. To prevent blinding, steel rollers are arranged to ride the outside as the screen revolves. Oversize material is discharged into the river as waste. There is not sufficient of this material found to warrant the installation of a crusher to reduce it to commercial size.

The sand and gravel passing the 2¼-in. openings but retained on the ⅛-in. screen are chuted to the boot of a continuous bucket elevator similar in construction but smaller in size than the ladder. This elevator discharges over two double-deck vibrating screens. The mesh of these screens is varied from time to time to produce the desired market sizes.

Material passing ⅜-in. round openings is designated as sand and is delivered from the vibrating screens through conveyors or chutes to the river as waste, or to a barge moored alongside the digger, depending on the demand for coarse sand.

Material passing the ⅛-in. jacket screen drops to a second continuous bucket elevator which discharges to a chute over the side of the digger. This discharge is also either chuted to waste in the river or to a barge as fine sand. The arrangement is such that this fine sand is discharged on one side of the digger while the coarse sand and gravel are discharged on the opposite side.

Both secondary elevators dig material from steel tanks in which the sand or gravel is chuted from the revolving screen. The constant agitation of the water and sand or gravel in these tanks by the moving elevator buckets keeps the fine mud and silt in suspension, and they pass off in an overflow from the tank. The elevators thus carry comparatively clean sand or gravel to the vibrating screens or barges. Further rinsing is provided, however, by additional wash water playing on the screens as the material is sized.

By a system of conveyors the two sizes of gravel can be loaded into the same barge or into separate barges at the will of the operator.

The No. 4 digger is steam driven and has an average capacity of 500 tons per hour. Production at this rate requires the handling of 8,000 gal. of wash water per min., or roughly 1,000 gal. per ton of material handled.

The second dredge, known as the *Kentucky,* is also of the steel-hulled ladder-type, designed and built by the Dravo Contracting Co. Since this dredge represents more modern construction it will be described in more detail.

The hull is of 5/16-in. mild open-hearth steel plate, 155 ft. long by 44 ft. wide and 8 ft. deep, fitted with suitable transverse and longitudinal frames and bulkheads.

The digging ladder is built of plate-and-angle sections. It is 88 ft. in length and provides a digging depth of 55 ft. below the water line. A 10-part line running over sheaves in the bail-and-bow gantry provides means for raising and lowering the ladder. The ladder is fitted with 86 cast-steel buckets of 4⅓ cu. ft. capacity each. These are fitted with heat-treated steel pins and manganese steel bushings. The buckets travel at a speed of 33 buckets per minute, corresponding to a digging capacity of 400 tons per hour.

The ladder buckets deliver their load of material to a hopper built of ⅜-in. and ½-in. steel plate fitted with cast steel (grizzly) bars to prevent the entry of oversize material. These are spaced at 6-in. intervals and are set at such an angle that boulders will move by gravity to the lower end and fall into the waste well. Cleaning bars operated by small steel cylinders are also provided to assist the oversize material on its way to the waste well. These cleaning bars are under the control of the dredge operator.

The material discharges by gravity to a steel washing tank from which it is elevated by a bucket elevator having 4-cu. ft. buckets and discharged to a 24-ft. rotary scrubber 6 ft. in diameter, fitted with a 13-ft. jacket 9 ft. in diameter. The first seven feet of the scrubber has 1¼-in. round perforations. The next 6-ft. section is a solid plate fitted with lifting angles for the purpose of lifting the gravel and letting it fall and thereby providing more thorough washing. The third section, 7 ft. long, has a screen with 2¼-in. perforations. The outer screen or jacket has ⅝-in. round openings. Wash water at high pressure is applied on all sections of the scrubber.

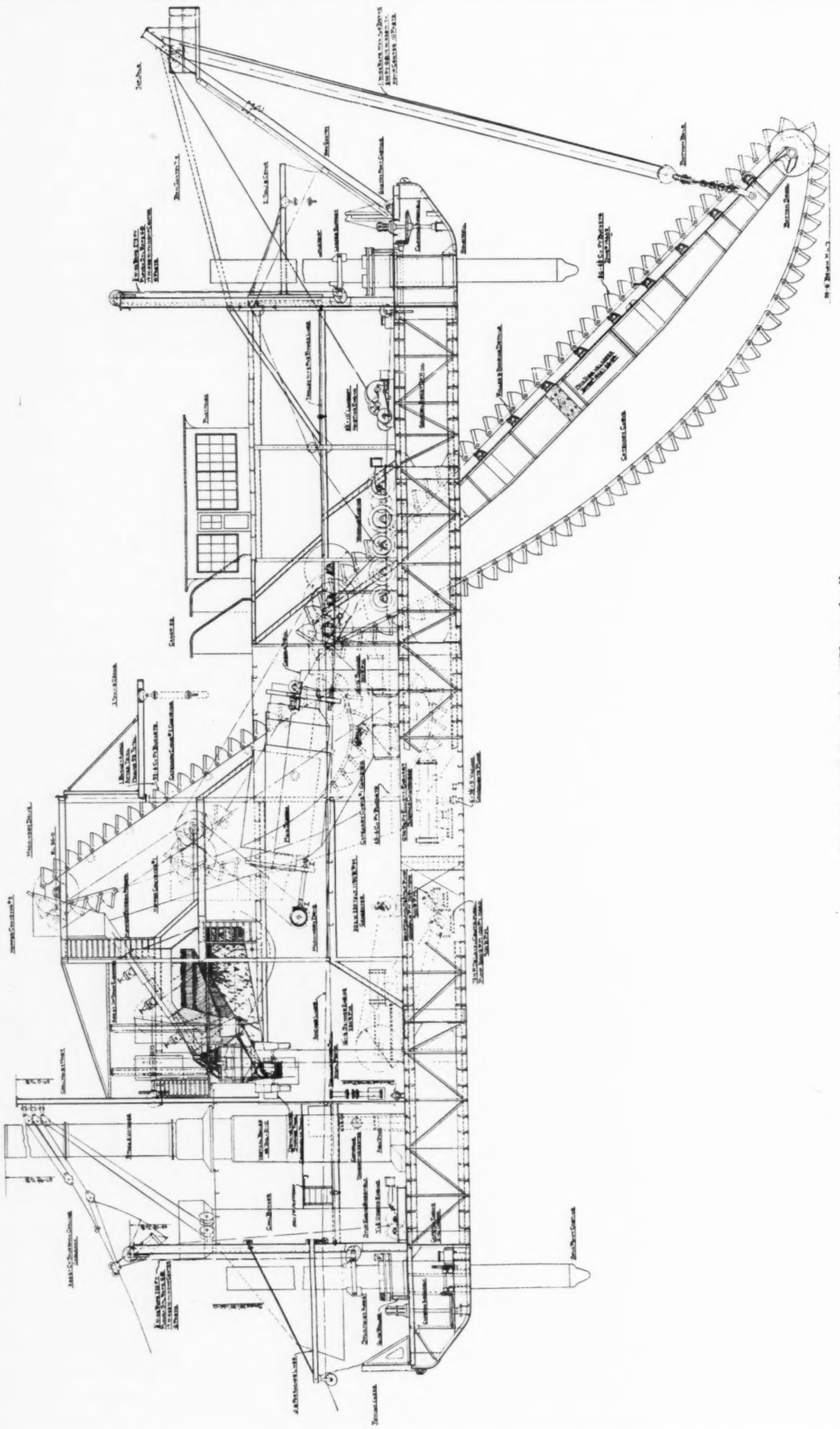
All material later passes over a flat steel pan where it is again subjected to the cleansing effect of high-pressure wash-water. From this pan the sand and gravel pass to a second steel washing tank fitted with a suitable overflow for excess wash water and suspended mud and silt. This overflow discharges to the river.

The clean sand and gravel in the washing tank is elevated by an elevator having buckets of 4 cu. ft. capacity each. The bottom spool can be raised or lowered at will. These buckets are of similar design and material as the digging-ladder buckets except as to size.

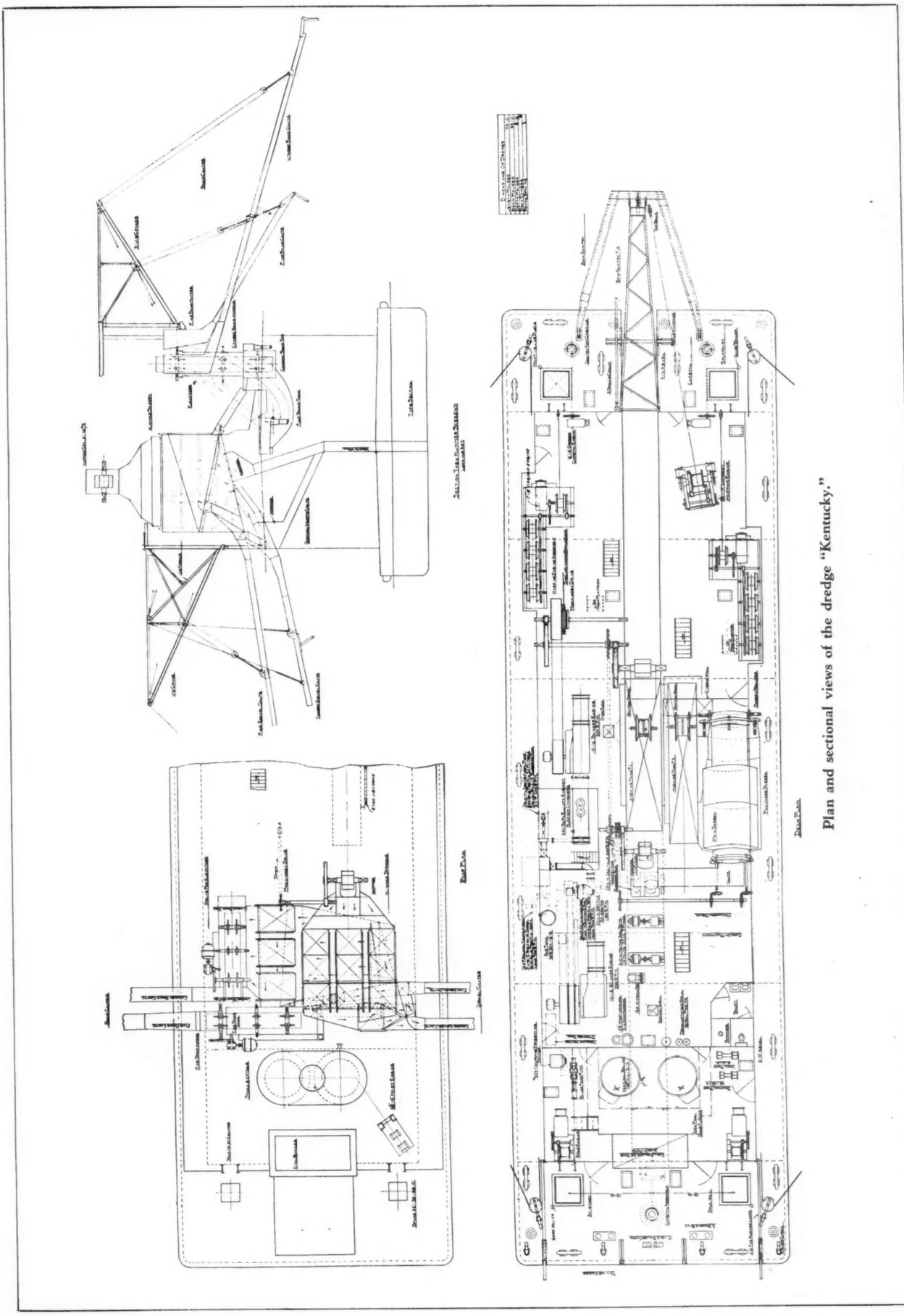
This elevator delivers the material to a three-way distributing hopper feeding nine Hum-mer screens operating in parallel sets. The upper six screens are ⅜-in. by ¾-in. woven mesh and the lower three ⅝-in. by ⅝-in. mesh.

The product passing through the first six screens moves to three Hum-mer screens fitted with 3/16-in. by ½-in. wire mesh. The oversize and undersize from this set of screens are dropped to bucket elevators and elevated to chutes discharging to barge or river as desired. That material passing over the ⅝-in. Hum-mer screens drops to a 4-ft. by 8-ft. Simplicity mechanically-vibrated screen, where it is drenched with final wash-water before its discharge to the gravel barge.

The two sand elevators are designed for a ca-



Elevation of the dredge "Kentucky."



Plan and sectional views of the dredge "Kentucky."

pacity of from 30 to 60 per cent of the digging capacity. The capacity is regulated by changing the speed of the elevator.

The ladder engine is a 150-hp., 16-in. by 16-in. Uniflow condensing engine operating at 200 r.p.m. This engine transmits power through a 6-ply balata belt to the transmission shaft. The digging ladder is operated by two sets of gears from the transmission shaft. This engine drives the ladder, rotary scrubber, and two main elevators.

The rotary scrubber is operated from the main ladder drive through sprockets and chain and two pairs of bevel gears. The main conveyors are operated through sprocket and shaft and sets of spur gears.

The engine driving the high- and low-pressure centrifugal pumps and the generator is similar to the main ladder engine, but running at 230 r.p.m.

The two sand elevators are driven by individual electric motors through speed reducers.

Wash water is provided by a 12-in. centrifugal pump operating at 900 r.p.m. against a head of 100 ft. and delivering 2,400 gal. per min.; a 10-in. centrifugal pump operating at 900 r.p.m. against a head of 40 ft. and delivering 1,600 gal. per min.; and a 6-in. centrifugal pump operating at 400 r.p.m. The first two pumps are belt driven from the auxiliary engine. The 6-in. pump is direct-connected to a single-cylinder vertical Engberg steam engine with 4-in. bore and 4-in. stroke.

Steam is furnished by two vertical fire-tube boilers of 150-hp. capacity each. They are 6 ft. by 21 ft. in size and fitted with 188 2½-in. tubes 14 ft. long. The boilers are designed for 170 lb. steam pressure and are provided with baffles in the upper part of the steam drum to obtain a high superheat.

The ladder hoist is a single-drum, double-reduction, reversible steam engine. Two double-cylinder, double-gear-reduction steam engines are provided for raising the stern spuds. There are two warping engines, one on each side of the boat. They are four-drum, double-reduction, two-cylinder steam engines. These engines also drive separate drums through another set of gears for hoisting the bow spuds.

The spuds are 36 in. by 36 in. by 66 ft. in size, built of ½-in. steel plate and 8-in. by 8-in. by ½-in. angles.

The electrical equipment consists of a Westinghouse 50-kw., 250-volt, 200-amp. generator operating at 1,150 r.p.m. and a 3½-kw., 16-amp., 220-volt generator direct connected to a single-cylinder Engberg steam engine with 4½-in. bore and 4-in. stroke operating at 505 r.p.m. The usual complement of auxiliary machinery and equipment suitable to this type of dredge is provided, including a well-equipped but small machine shop.

Both No. 4 digger and the dredge *Kentucky* are served by the steamer *Duffy* and twenty steel barges of 650 tons capacity each.

The *Duffy* is a flat-bottomed, steel-hulled, stern-wheel river towboat, 25-ft. by 135-ft. overall with a depth from deck to bottom plates of 5 ft. and a draft of 3½ to 4 ft. She is powered by three fire-tube marine boilers 38 in. in diameter by 26 ft. long, each having six 6-in. tubes. These boilers provide steam at 240-lb. pressure to operate the driving engines and all auxiliary pumps and machinery.

The driving mechanism consists of two noncondensing Hegewald steam engines with 15-in. cylinders and 4½-ft. stroke. The pistons are direct-connected to the cranks operating the stern paddle wheel, one engine on each side. The usual complement of boiler-feed pumps, steam winches, and capstans is present and in addition the steamer carries three light plants. One is a Pyle National, 13-amp., 120-volt generator, direct-connected to a small steam turbine and is used for emergency or for such lighting as is needed during daylight. A Delco lighting plant is provided to operate a refrigerating plant. A Troy, single-cylinder, 8-hp. steam engine belted to a Willey 8¼-kw., 120-volt, 66-amp. generator provides current for searchlights and general lighting for night operation.

The steamer is provided with Gardner steam-driven steering gear. It can pull ten loaded barges downstream at a speed of about three miles per hour.

Sand and gravel brought from the dredges in steel barges is moored to the river bank at Louisville, while the towboat returns the empty barges to the dredges.

Loaded barges are manipulated under the unloading equipment by means of a double-drum Thomas hoist engine installed on a steel-hulled landing barge or pump boat. This hoist is operated by steam at 100-lb. pressure furnished by a 150-hp., marine-type, water-tube boiler also located on the pump boat. This boat is kept moored at the landing and serves as a landing dock or floating wharf over which supplies are moved to the towboats.

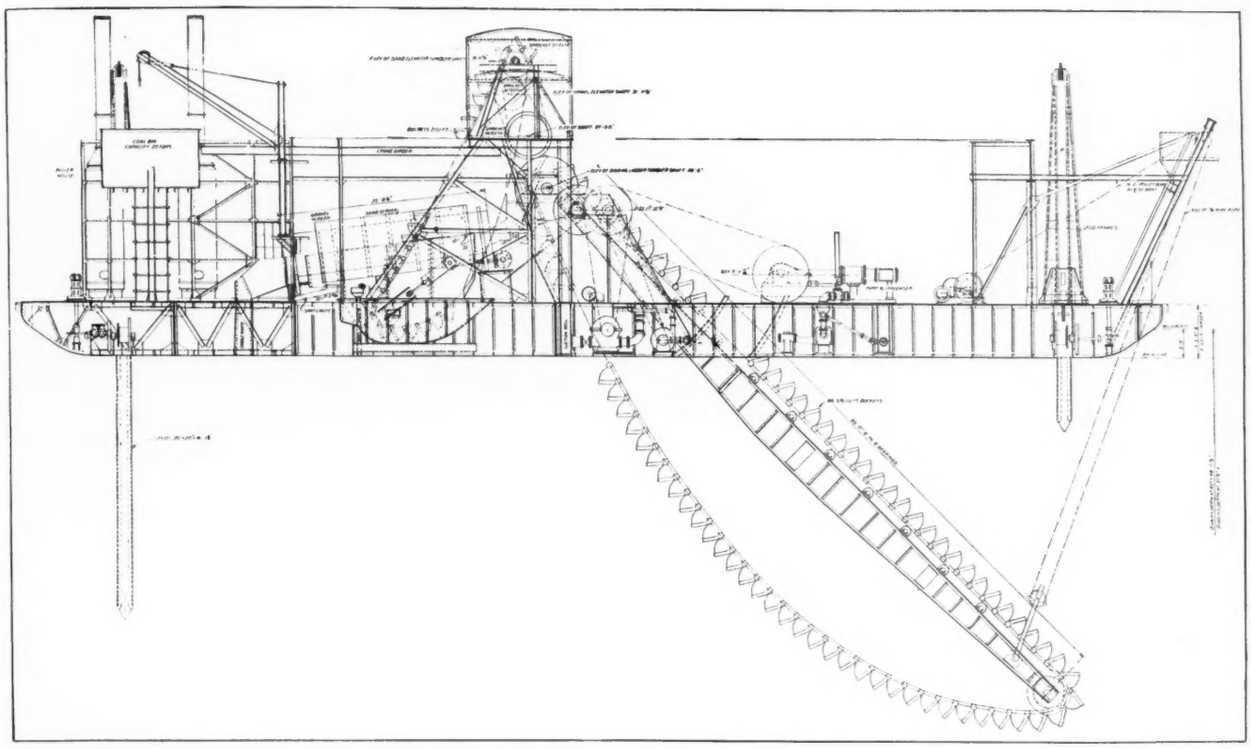
By means of the double-drum hoist loaded barges can be moved in either direction, spotted in position for unloading, and moved as unloading proceeds. The empties are removed and replaced by loaded barges by the same power.

Gravel is unloaded by a Brownhoist bridge crane equipped with a 3½-cu. yd. clamshell bucket. This crane is of steel construction, cantilever type, with an overall reach of 200 ft. The crane is stationary and all barges must be spotted under it.

Paralleling the river and underneath the crane is a railroad spur track on which cars are spotted for direct loading from the barge when necessary. Ordinary procedure, however, involves discharging the crane bucket to a steel hopper of 25-cu. yd. capacity located between the spur and the river bank.

The hopper delivers the material to a 36-in. rubber conveyor belt through a 48-in. steel pan feeder operated through an eccentric. This belt travels at 240 ft. per min. and discharges either directly into railroad cars on the spur after passing over a Weightometer, or over a shaking screen with ¼-in. slotted openings to a second 36-in. rubber conveyor belt.

The first belt is about 75 ft. long and operates on an incline of 18 per cent. When discharging over the screen to the second conveyor the gravel is sub-



Elevation view of the No. 4 digger used on the Ohio River.

jected to a final rinsing by a stream of water playing on the gravel as it passes over the screen. The screen is actuated by an eccentric driven from the head-pulley shaft of the first conveyor. Wash water and sand are returned to the river. The initial conveyor is driven by a 10-hp. electric motor operating on 440-volt, alternating current.

The second or main conveyor is 36 in. wide and 600 ft. long and runs up an 18-per cent grade for 75 ft. and level for the balance of its travel except as it rises to pass over the tripper. This belt is driven by a 35-hp. motor. This main conveyor delivers through a double-discharge tripper to either of two shuttle conveyors set at right angles to the main conveyor.

The shuttle conveyors are driven by 12-hp. motors. The belts are 36 in. wide and 125 ft. long and are reversible in direction. Running in one direction, No. 1 shuttle delivers through a movable tripper to a series of seven concrete bins each of which holds 500 tons. These are used as gravel bins and separate such gravel sizes as have been made on the dredge. No attempt is made to resize or grade either sand or gravel except on the dredge. Delivery from the bins is to motor trucks through hand-operated flat horizontal gates. Operating in reverse direction, this shuttle conveyor delivers gravel to a ground storage pile.

The No. 2 shuttle conveyor is also reversible in direction, delivering to ground storage in one direction and to six concrete bins of 350-tons capacity each in the other direction. This shuttle is used to deliver sand to the bins or gravel or sand to storage, as may be required. The bins store the fine, medium, and coarse sand as delivered by the dredge and load the material into motor trucks.

Either of these shuttles can discharge directly to railway cars on a spur running below them and paralleling the main conveyor. The No. 2 shuttle conveyor also delivers material beyond the sand bins to a fifth conveyor 24 in. wide which, in turn, delivers to either of two 24-in. by 260-ft. storage conveyors which discharge to ground storage. In reverse direction this shuttle delivers to an eighth conveyor 24 in. wide, on 150-ft. centers, which discharges to ground storage.

Centrally-located near the main conveyor is the control room from which all belts are operated. All belts may be instantly stopped by push-button control from the control room or from points located at 30-ft. intervals throughout the system. The first belt carrying material from the hopper under the bridge crane may be operated either from the crane or from the control room.

All belts are driven by separate motors operating on 440-volt, alternating current. The two long storage belts are run by 25-hp. motors and the short storage belt is operated by a 15-hp. motor. All 36-in. belts operate at a speed of 240 ft. per min. and the 24-in. belts at 320 ft. per minute. The system has a capacity of 350 tons per hour and is lighted so it can be operated day or night.

The yard has a capacity of 150,000 tons of sand and gravel in ground storage and in addition the railway spurs will hold 35 60-ton cars.

Cars spotted on the river spur are moved by a double-drum Thomas elevator hoist and 1½-in. cable controlled by the crane operator. This hoist is powered by a 75-hp. motor and can handle 15 loaded cars at one time. All chutes discharging

Table I—OPERATING COSTS PER TON OF DRY SAND PRODUCED—1927

	Labor		Power		Supplies		Depreciation		Total	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
DIGGING										
No. 3 Digger	$ 7,061.85	$0.096	$ 1,692.72	$0.023	$ 4,168.51	$0.057	$ 2,974.75	$0.040	$15,897.83	$0.216
No. 4 Digger	22,424.75	.030	10,759.28	.015	36,209.86	.049	22,036.57	.029	91,430.46	.123
TOWING										
Str. "Duffy"	11,480.05	.014	7,736.71	.009	3,377.80	.004	5,753.03	.007	28,347.59	.034
Storage	18,841.30	.030	4,050.00	.006	30,727.35	.048	11,234.58	.018	64,853.23	.102

material from trippers are lined with rubber. These rubber linings have been found to outlast an equal thickness of steel plate many times.

A gasoline-driven crawler-mounted crane loads railway equipment from storage piles. This crane is equipped with a ½-cu. yd. clam-shell bucket. For wagon or truck loading from storage the yard is equipped with four Barber-Green gasoline-driven portable loaders mounted on crawlers. There is also provided a Green slip-scoop or drag-bucket of 1¼-cu. yd. capacity for loading railway cars from storage. This is equipped with a Thomas elevator hoist powered by a 75-hp. motor.

The bridge crane is also used in transferring heavy machinery from shore to river equipment and has a capacity of 10 tons. The crane is powered by three separate motors, one for hoisting, one for closing and one for travel. All are of 150 horsepower and interchangeable.

For city delivery the company maintains a fleet of ten Mack and White 5-ton trucks, all of which are garaged in one corner of the yard which is 600 ft. by 800 ft. in size and floored entirely with concrete. At one end of the garage is a completely equipped machine shop wherein all equipment repairs are made as needed.

All storage piles are confined behind 9-ft. concrete retaining walls and the conveyor supports are reinforced concrete with supporting spans of structural steel. No provision has been made at the land plant for rescreening or grading either sand or gravel. Material is merely transferred from barges to storage bins or railway equipment.

All sizing and grading is done on the dredges and ordinarily two sizes of gravel and three of sand are made. The sand, however, is graded as to color also. Some of the deposits produce a gray sand and others a red sand. These are handled and stored separately for marketing purposes.

Personnel and wage rates are as follows:

Storage-yard crew:

Crane man	$6.50
Hopper tender	4.00
Car cleaner	5.00
Wagon loader	6.00
Barge tenders (3), each	4.00
Operator, bridge crane	7.50
Belt operator	5.00
Electrician	7.50
Car tender	4.00

Steamer *Duffy:*

Pilot	$10.00 and board
Engineer	7.00 and board
Mate	4.75 and board
Firemen (2), each	4.75 and board
Cook	3.00 and board

Dredge *Kentucky:*

Operator	$8.00 and board
Engineer	7.75 and board
Fireman	4.50 and board
Deck hands (2), each	4.00 and board
Mate	4.50 and board
Night watchman	4.00 and board
Cook	3.00 and board

No. 4 Digger:

Operator	$8.00 and board
Engineer	7.75 and board
Oiler	4.00 and board
Fireman	4.50 and board
Deck hands (2), each	4.00 and board
Mate	4.50 and board
Night watch	4.00 and board
Cook	3.00 and board

Costs for the year 1927, rather than more recent figures are shown in Tables I and II, because, during that year, the dredging equipment had a mini-

Table II—SUMMARY OF COSTS IN UNITS OF LABOR—1927

	Digging	Towing	Storage
LABOR (man-hours per ton)			
No. 3 Digger	0.12		
No. 4 Digger	.036		
Total digging	.044		
Steamer "Duffy"		0.022	
Storage yard			0.061
Total man-hours per ton dug	.114		
POWER			
Kw.hr. per ton			0.255

Labor, per cent of total cost	30.0
Supplies and power, per cent of total cost	49.3
Depreciation, per cent of total cost	20.7

mum of lost time and operating costs are therefore more truly representative of the capability of the different types of equipment.

No. 3 digger was a centrifugal-pump dredge operating a 10-in. pump. This unit has since been abandoned and the *Kentucky* substituted.

High-Early-Strength Cements Being Investigated by Bureau

The U. S. Bureau of Standards is continuing its investigation of the properties of high-early-strength Portland cements, begun in November, 1929.

The tests include the making and testing of a number of 6-in. by 12-in. concrete cylinders, mixed in the proportions of 1:2:4 and with 6½, 7½ and 8½ gallons of water per sack of cement. Tests of compressive strength have been or will be made at the ages of 1, 3, 7 and 28 days, and one and two years, of cylinders cured in damp rooms. Air-cured cylinders are tested at the ages of 7 and 28 days, and at 1 and 2 years. Freezing and thawing tests also are being made.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

Photo by Strauss

C. G. BESCH
President
Standard Building Materials Co.
St. Louis, Mo.

Personal Mention

Abe Hart, of the Hart Gravel Co., Sandborn, Ind., is reported to be planning the construction of another sand-and-gravel plant near Elliston, Ind.

J. L. Masters, 822 N. High St., Columbus, O., expects to complete soon the rebuilding and enlargement of the quarry plant at the Iowa state penitentiary upon which he has had charge for several months.

T. P. Pendleton, for many years associated with the U. S. Geological Survey in charge of its aerial photographic section and more recently with Brock & Weymouth, Inc., of Philadelphia, as chief engineer, has become chief engineer of the Aerotopographic Company of America.

Charles S. Bilyeu, for the last eight years with Sanderson & Porter, engineers, of New York City, has been appointed manager of the structural steel inspection department of the Robert W. Hunt Co., with headquarters in Chicago. He will have jurisdiction over the testing and inspection of steel for buildings and bridges in all districts of the organization, succeeding **W. T. Reeves**, who has been appointed consulting engineer of the structural department and will continue and extend his activities in this field.

Gotlieb Keil of Hudson, N. Y., has plans in progress for the construction of a stone-crushing plant, to be located near Hudson.

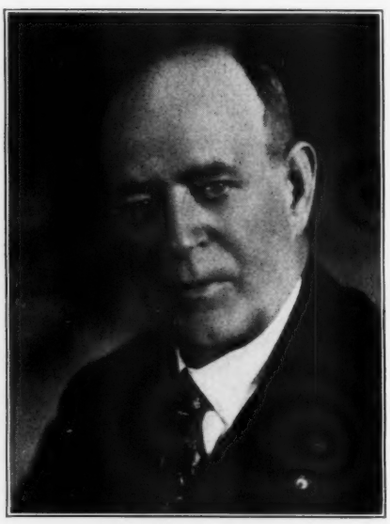
Darwin Meisnest, who has served the Pacific Coast Cement Co. as sales manager since its inception, was recently named vice-president in charge of sales.

J. F. Griswold has been named president and a member of the board of Foote Brothers Gear & Machine Co., succeeding **W. C. Davis. A. B. Wilder** also has been named a member of the board. Other new officers elected are: Vice-president, **F. A. Emmons**; secretary and treasurer, **A. L. Gray**; assistant treasurer, **J. R. Fagan**; and assistant secretary, **O. R. Moss. W. A. Barr** and **H. A. Bates** were reelected vice-presidents.

James S. Witmer, since 1920 general sales manager, J. I. Case Co., Racine, Wis., has been appointed assistant to **C. Ray Messinger**, new president of the Oliver Farm Equipment Co. Mr. Witmer became associated with the Case threshing machine works in 1902.

T. C. Mullins, chief chemist at the Crestmore, Cal., plant of the Riverside Cement Co. addressed the Lions Club of Rialto, Cal., recently. Mr. Mullins described the making of Portland cement.

O. C. Hunt has been made sales manager in charge of the territory served by the Des Moines plant of the Pennsylvania - Dixie Cement Corp., New York, N. Y. His headquarters will be in the Insurance Exchange Building, Des Moines, Iowa. **R. J. Hild** continues as district sales manager. Prior to his connection with the cement industry more than 16 years ago, Mr. Hunt had wide experience in the building supply business. For more than a year he has managed one of the eastern sales districts of the Penn-Dixie organization. **L. C. Currinder** has also joined Penn-Dixie's western staff, with headquarters in the Des Moines office of the corporation.



M. S. Kincaid.

M. S. Kincaid was recently appointed district sales manager for Burton Explosives, Inc., with offices at 2013 Fisher Bldg., 343 So. Dearborn St., Chicago, Ill. Mr. Kincaid's territory includes the entire middle west and extends west to Colorado, south to Texas, and east to Indiana. Because of his 33 years of experience in the sale and use of explosives in all parts of the country he is also able to offer a consulting service to quarry and mine operators.

L. P. Spillan, sales manager of the shovel and crane division of Link-Belt Co., Chicago, announces the Stockland Equipment Sales Co., 2628 University Ave., S. E., Minneapolis, Minn., as its shovel-crane-dragline agent in Minnesota (excepting a few counties around Duluth), and part of central-west Wisconsin. **J. W. Chapman**, general manager of Stockland Equipment Sales Co., has, for many years, been active in that territory. Sales representatives of his organization have permanent offices at Thief River Falls, Marshall, Brainerd and St. Paul, Minn., and at Barron, Mauston, and Eau Claire, Wis., giving local concentration and service backed by an organization that has a reputation for excellent service.

Obituary

Frank K. Hoover, noted contracting engineer and long-time resident of Chicago, passed away at his home in Chicago on March 6. He is survived by his wife, Mrs. Effie P. Hoover, and two sons, Ray Phelps Hoover of Evanston, Ill., and H. Earl Hoover of Glencoe, Ill. Mr. Hoover was 77 years old at the time of his death, and had been active in business and financial circles up to the last. He was born in North Canton, O., January 19, 1854. In 1894, he associated himself with Arthur J. Mason, civil engineer, forming the firm Hoover & Mason, in developments connected with excavating and conveying machinery for dredging and mining. The business was removed to Chicago, Ill., in 1902, and was conducted by Mr. Hoover as sole proprietor after the withdrawal of Mr. Mason in 1910. Besides the firm of Hoover & Mason, Mr. Hoover was interested as president and director in the Hoover & Mason Phosphate Co., director of The Hoover Co., the American Sintering Co., the Ruhm Phosphate & Chemical Co., and the Phelps Stone & Supply Co.

F. B. Hamilton, 64, formerly chemist at the La Salle, Ill., plant of the Alpha Portland Cement Co., died at La Grange, Ill., Feb. 20, 1931, after a long illness. His retirement from service about a year ago was due to ill health and culminated close to twenty-five years of association with the Portland-cement industry.

Mr. Hamilton began his career with the Lehigh Portland Cement Co. at the Coplay, Pa. plant. This was followed by services as assistant chemist at the Mitchell, Ind., plant of the same company. Thence he went to the German-American Portland Cement Co., at La Salle, Ill., as chief-chemist. His many years of service at this plant was broken by one year as chief-chemist of the plant of the Henry Cowell Lime & Cement Co. at Cowell, Cal. When the La Salle plant was later taken over by the Alpha company Mr. Hamilton continued as chemist until his retirement.

Mr. Hamilton was born in Brooklyn, N. Y. He is survived by his widow, a son, a daughter and three grand children.

Harry P. Readmon, for the past 12 years purchasing agent of the Chicago Pneumatic Tool Co., New York, died on Feb. 26, aged 53 years.

Coming Events

April 2, 1930. Davenport, Ia. Regional safety conference of Portland-cement plants in Portland Cement Assn. group. Hotel Blackhawk. H. F. Tyler, Dewey Portland Cement Co., Davenport, Ia., chairman.

April 14, 1930. Albany, N. Y. Regional safety conference of Portland-cement plants in Portland Cement Assn. group. Hotel Ten Eyck.

April 17, 1930. Pittsburgh, Pa. Regional safety conference of Portland-cement plants in Portland Cement Assn. group. William Penn Hotel.

April 13-18, 1931. Cleveland, O. National Industrial Equipment Exposition, in connection with Congress on management, maintenance and materials-handling of A. S. M. E. G. E. Pfisterer, managing director, 308 W. Washington St., Chicago, Ill.

May 4, 1931. New York, N. Y. Thirteenth exposition of Chemical Industries, Grand Central Palace. International Exposition Co., managers, Grand Central Palace, New York.

June 3-4, 1931, White Sulphur Springs, W. Va. Thirteenth annual convention, National Lime Assn., Greenbrier Hotel. Norman G. Hough, president and general manager, 927 15th St., N. W., Washington, D. C.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fourteen Years Ago

ARTICLES of incorporation were filed in Iowa by the Mt. Pleasant Crushed Stone Co. of Mt. Pleasant, Ia. Capitalization was for $60,000. Officers were Ralph M. Burtis, Chicago, president; E. K. Stahl, Mt. Pleasant, vice-president; F. H. Kling, Chicago, treasurer; and E. Metcalf, Chicago, secretary.

* * *

The largest gyratory crusher ever manufactured was installed at the plant of the Michigan Limestone & Chemical Co. at Calcite, Mich., by the Kennedy-Van Saun Manufacturing Co. of New York, N. Y. The crusher, a Kennedy No. 60, had a capacity of 25,000 tons per 20-hour day. The main shaft was 3 ft. in diameter at its largest portion by 28 ft. in length.

* * *

Ten Years Ago

THE Newport Sand & Gravel Corp. was organized at Rochester, N. Y., with a capital of $20,000. H. Barvard, A. W. Magrander, and P. J. Emmell, all of Rochester, were the incorporators.

* * *

The plant of the Kinzel-Thompson Sand & Gravel Co. of Knoxville, Tenn., was described in an article written by Fred L. Conner, president of the concern. Raw material, dredged from the bed of the Tennessee River, was transported by barges to the shore plant where, after washing and screening, it was stored in 1½-in., ⅞-in., ¼-in. sizes, as well as three grades of fine sand.

* * *

"Are Your Cars Loaded to Capacity?" was the subject of an article by Daniel J. Hauer. The article was a timely one, inasmuch as producers were faced with a car shortage due to heavy demands on rolling stock for transportation of goods during the period of reconstruction which followed the close of the World War.

* * *

One of the largest quarry blasts of the time was set off at Laughlin Quarries, Williamsburg, Pa. The charge brought down 100,000 tons of limestone.

* * *

A merger was effected between the new Martinsville Sand Co. and the Corliss Sand Co., both of Martinsville, W. Va., under the name of the former concern.

* * *

Five Years Ago

NEWLY incorporated producing companies included The Lincoln Gravel Co., Star City, Ark.; Madison Sand & Gravel Corp., Hamilton, N. Y.; Flushing Sand & Gravel Co., Flushing, N. Y.; Perrin Hampton Springs Sand Co., Chicago, Ill.; and the Pennfield Stone Corp., Rochester, N. Y.

* * *

Improvements costing more than $500,000 were being completed at the plant of the Signal Mountain Portland Cement Co. of Chattanooga, Tenn., increasing the plant's capacity from 1,000,000 to 1,500,000 bbl. per year. New equipment included a 175-ft. rotary kiln and several raw- and finish-grinding mills. The changes were made under the supervision of the Cowham Engineering Co. of Chicago, operators of the plant.

* * *

V. P. Ahearn was appointed executive secretary of the National Sand and Gravel Assn. to succeed the late T. R. Barrows.

* * *

One of the early ready-mixed concrete plants was described in an article devoted to the operations of the Pre-Mixed Concrete Co. of San Diego, Cal. The plant was designed and operated by R. W. Whitaker, who for four years previous had served as a field engineer of the Portland Cement Assn.

New Corporations

GENERAL AGGREGATES CORP., Sterick Bldg., Memphis, Tenn., $5,000,000. Merger of Central Sand & Gravel Co., 260 Walnut St., Memphis, Tenn.; Greenville Sand & Gravel Co., Greenville, Miss.; Ohio River Sand & Gravel Co., Paducah, Ky.; Cedar Bluff Quarry Co., Princeton, Ky.; Cerulean Stone Co., Cerulean, Ky.; Camden Gravel Co., Camden, Tenn.; Officers are: A. J. Hoffman, president; L. T. McCourt, vice-president; W. E. McCourt, manager. Crushed stone, sand, gravel, rip-rap and limestone will be produced.

MICHIGAN TRANSIT MIXED CONCRETE CO., Detroit, Mich. $400,000. John A. Mercier, Gage W. Cooper and Thomas E. Currie, 909 Transportation Bldg. To manufacture concrete and other construction materials.

PILLMAN SAND & GRAVEL CO., 9th & Ohio Sts., Evansville, Ind., 300 shs. n.p.v. Incorporators are: Charles H. Pillman, 1206 S. Governor St., vice-president; Marion J. Rice, 1204 E. Blackford Ave., president; James Wilson, 2105 W. Illinois St.; Robert J. Melcher, 319 E. Franklin St., and Charles J. Eichel, Sr.

ZANESVILLE GRAVEL CO., Zanesville, O. 1250 shs. n.p.v. Charles H. Everitt, I. M. Gardner, Thomas S. Johnson and Wm. P. Coyle, 1231 Atlas Bldg., Columbus, O.

GEORGIAN BAY GRAVEL CO., LTD., Windsor, Ont., Can. $60,000. John M. Lorimer and others.

PROVINCIAL SAND & GRAVEL CO., LTD., Montreal, Que., Can. $10,000.

KANNENBERG GRANITE CO., R. 3, Wausau, Wis. $45,000. Ernest Kannenberg, Sr., president; Frank Schock, vice-president; Roland K. Kannenberg, secretary-treasurer.

Using Pulverized Iron as Concrete Hardener

What is probably the best and at the same time the most convenient way permanently to waterproof concrete, brick and masonry walls and floors is by what is known as the iron method. This system works equally as well on either the inside or outside of both old and new buildings.

The metallic iron used for this purpose is in a highly pulverized state and is simply mixed with water and applied with a brush. Detailed instructions for doing this work as well as

(*Continued on page 68*)

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Indiana Limestone's Net Up 50 Per Cent in 1930

Indiana Limestone Co. and subvember 30, 1930, net profit of $15,227 after depreciation, depletion, interest and federal taxes, equivalent to 30 cents a share on 50,000 shares (par $100) of 7-per cent preferred stock. This compares with $10,349 or 20 cents a share on preferred stock in year ended November 30, 1929.

Consolidated income account compares as follows:

	1930	1929
Net sales	$10,351,643	$10,917,268
Cost and expenses	8,675,776	9,175,833
Operating profit	$1,675,867	$1,741,435
Other income	82,441	63,437
Total income	$1,758,308	$1,804,872
Depletion and depreciation	589,939	613,274
Interest	1,149,142	1,178,249
Federal taxes	4,000	3,000
Net profit	$15,227	$10,349

Superior Portland Nets 73 Cents on "A" Stock

The balance sheet position of Superior Portland Cement Co., after making allowance for the company's plan of retiring class A stock through purchase in the open market, indicates net profits for the year ended December 31, 1930, of $56,000, equal to 73 cents a share on the 76,145 shares of class A stock outstanding at the close of the period.

This compares with $345,000 earned after all charges in the preceding year, or $4.49 a share on the 76,733 class A shares then outstanding.

During 1930, the company paid the regular dividend of $3.30 a share on class A stock, while $1 a share was distributed to the class B stock. Under the company's retirement plan, 588 shares of class A stock were purchased and canceled during the year, against 4,267 shares retired in the previous year.

Although total assets of the corporation decreased during 1930, due principally to write-offs in the investment, inventory and plant accounts, a substantially better current position is shown in the comparison of the report as of December 31, 1930, with those of the close of previous years.

As of December 31, 1930, the ratio of total current assets to total current liabilities was 8.1 to 1, against 3.2 to 1 as of December 31, 1929, 1.9 to 1 as of December 31, 1928, and 1.7 to 1 as of December 31, 1927.

Total current assets increased $162,538 to $651,626 as of December 31, 1930. Of this total, cash, which increased $173,789 during the year, represented a 38.6-per cent proportion.

Pacific Coast Operator Reports 1930 Business

Net income of Pacific Coast Aggregates, Inc., for the year ended December 31, last, before depreciation and taxes, amounted to $116,985.84, according to the annual report recently issued by Charles M. Cadman, president. The company's total sales of all products for 1930 comprised of rock, sand, gravel, building materials and fuel, amounted to $3,174,788.15. Rock, sand and gravel sales totaled 38,279 carloads, having a gross tonnage of in excess of 2,500,000 tons.

Tonnage on the company's books for future shipments, as of January 1, amounted to approximately 320,000 tons. The company operated thirteen plants during the year, either steadily or intermittently, depending on business conditions.

Lawrence Cement Reaps Substantial 1930 Profit

The report of Lawrence Portland Cement Co. for the year ended December 31, 1930, shows net profit of $763,302 after depreciation, interest, amortization and federal taxes, etc., equivalent to $10.18 a share on 75,000 shares of $100 par capital stock. This compares with $476,725, or $6.35 a share in 1929.

The balance sheet as of December 31, 1930, shows total assets of $11,686,417, compared with $11,489,490, and surplus $1,936,119, against $1,508,848. Current assets amounted to $2,341,185 and current liabilities to $279,298, as compared with $1,944,017 and $240,642, respectively, at end of preceding year.

Johns-Manville Earned $3.66 per Share in 1930

Johns-Manville Corp. and subsidiary companies, manufacturers of asbestos and magnesia products, report for year ended December 31, 1930, net profit of $3,268,123 after depreciation, federal taxes, etc., equivalent, after dividend requirements on 7 per cent preferred stock, to $3.66 a share on 750,000 no-par shares of common stock. This compares with $6,591,916, or $8.09 a share on common in 1929.

Consolidated income account for year 1930 compares as follows:

	1930	1929
Sales	$49,492,047	$61,994,884
Costs and exp.	43,782,409	52,771,966
Profit	$ 5,709,638	$ 9,222,918
Depr. and depl.	2,006,999	1,857,135
Federal taxes	434,516	773,866
Net profit	$ 3,268,123	$ 6,591,915
Pfd. dividends	525,000	525,000
Com. dividends	2,250,000	2,250,000
Surplus	$ 493,123	$ 3,816,916

Consumers Co. Earnings Show Decrease in 1930

Consumers Co., producer of aggregates and retailer of coal, ice and building materials in the Chicago area, reports for year ended December 31, 1930, net profit of $95,524 after interest, depreciation, depletion, federal taxes, etc., equivalent to $1.36 a share on 70,000 shares of 6-per cent prior preference stock. This compares with net profit in 1929 of $853,035 equal, after dividends on 6-per cent and 7-per cent preferred stocks, to 28 cents a share on 733,110 common shares.

CURRENT DIVIDENDS

Company	Class of Stock	Dividend Rate	Holders of Record	Payable	Company	Class of Stock	Dividend Rate	Holders of Record	Payable
Alpha Portland Cement	Preferred	$1.75 qr.	Mar. 2	Mar. 14	Lehigh Portland Cement	Preferred	$1.75 qr.	Mar. 14	Apr. 1
Canada Cement Co	Preferred	$1.62½ qr.	Feb. 28	Mar. 31	Leslie-California Salt	Common	$0.20 qr.	Mar. 2	Mar. 14
Canada Paving & Supply	1st Pfd.	$1.75 qr.	Feb. 20	Mar. 1	Material Service	Common	$0.50 qr.	Feb. 15	Mar. 1
Cleveland Quarries	Common	$0.75 qr.	Feb. 14	Mar. 1	McWilliams Dredging	Common	$0.37½ qr.	Feb. 20	Mar. 1
Cleveland Quarries	Common	$0.75 extra	Feb. 14	Mar. 1	National Gypsum	Preferred	$1.00 qr.	Mar. 20	Apr. 1
Fitzsimmons-Connell Dredge & Dock	Common	$0.50 qr.	Feb. 20	Mar. 1	Owens-Illinois Glass	Preferred	$1.50 qr.	Mar. 16	Apr. 1
General Asphalt	Common	$0.75 qr.	Mar. 2	Mar. 16	Superior Portland Cement	Class A	$0.27½M	Feb. 23	Mar. 1
General Refractories	Common	$1 00 qr.	Feb. 10	Feb 25	Superior Portland Cement	Class B	$0.25 qr.	Mar. 14	Mar. 20
International Cement	Common	$1.00 qr.	Mar. 11	Mar. 31	U. S. Gypsum Co	Preferred	$1.75 qr.	Mar. 14	Mar. 31
International Salt	Common	$0.75 qr.	Mar. 16	Apr. 1	U. S. Gypsum Co	Common	$0.40 qr.	Mar. 14	Mar. 31
Kentucky Rock Asphalt	Preferred	$1.75 qr.	Feb. 17	Mar. 1	Warner Company	Common	$0.50 qr.	Mar. 31	Apr. 15
Lawrence Portland Cement	Common	$1.00 qr.	Mar. 16	Mar. 31	Warner Company	1st Pfd.	$1.75 qr.	Mar. 14	Apr. 1
					Warner Company	2nd Pfd.	$1.75 qr.	Mar. 14	Apr. 1

Latest Portland-Cement Statistics

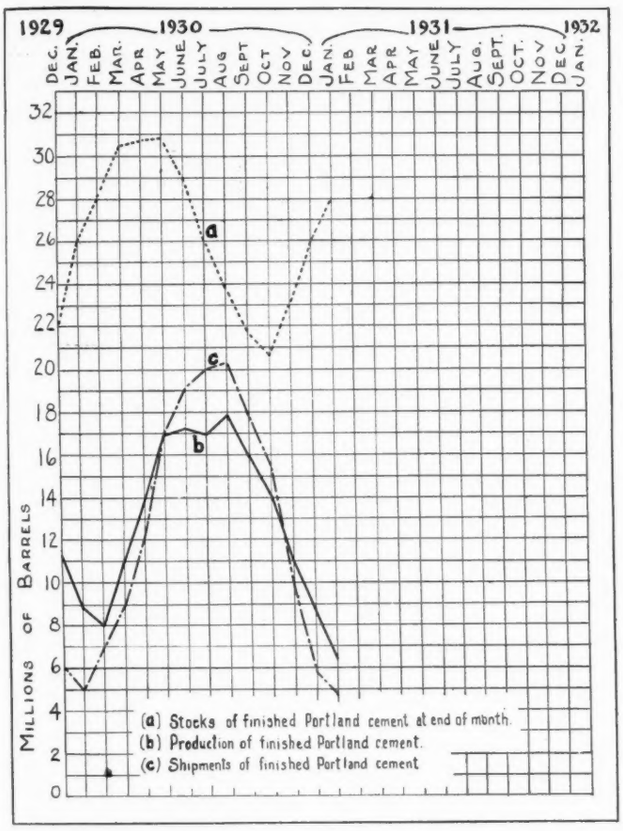


Chart showing production, shipments and stocks on hand, by months, from December, 1929, to February, 1931.

THE Portland cement industry in February, 1931, produced 5,920,000 barrels, shipped 5,048,000 barrels from the mills, and had in stock at the end of the month 28,478,000 barrels. Production of Portland cement in February, 1931, showed a decrease of 27.5 per cent and shipments a decrease of 28.0 per cent, as compared with February, 1930. Portland cement stocks at the mills were 0.8 per cent higher than a year ago.

In the statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of February, 1931, and of February, 1930. The estimates include increased capacity due to extensions and improvements during the period.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN JANUARY, 1931

Exported to—	Barrels	Value
Canada	1,692	$ 7,977
Central America	14,207	29,643
Cuba	3,310	6,878
Other West Indies and Bermuda	997	2,439
Mexico	2,609	7,359
South America	16,215	48,654
Other Countries	2,169	12,728
Total	41,199	115,678

DISTRIBUTION OF CEMENT

Shipped to—	December		January	
	1929	1930	1930	1931
Alabama	115,961	77,946	106,309	88,798
Alaska	962	142	1,590	11
Arizona	46,831	30,171	49,286	36,015
Arkansas	84,761	63,553	43,629	54,904
California	728,509	704,699	560,052	580,888
Colorado	32,359	19,474	14,818	20,937
Connecticut	62,419	68,997	63,245	40,081
Delaware	11,737	12,883	12,810	10,916
District of Columbia	44,485	59,861	44,747	53,960
Florida	84,792	60,233	91,344	64,038
Georgia	101,776	86,898	87,956	83,687
Hawaii	19,772	19,770	27,413	24,971
Idaho	6,642	4,829	2,585	4,465
Illinois	263,469	247,845	182,347	195,146
Indiana	108,261	80,190	94,596	79,310
Iowa	35,737	40,965	34,357	30 333
Kansas	105,763	78,186	45,558	70,951
Kentucky	46,660	54,631	32,854	56,581
Louisiana	171,845	130,600	175,009	133,695
Maine	19,014	26,759	14,125	8,263
Maryland	79,751	84,223	80,253	48,532
Massachusetts	101,340	153,583	104,522	106,524
Michigan	224,563	194,610	203,440	174,367
Minnesota	52,991	64,412	59,107	46.987
Mississippi	64,336	32,986	52,518	37,644
Missouri	142,398	188,762	76,507	167,209
Montana	8,041	9,612	6,175	9,502
Nebraska	33,088	21,890	22,811	16,464
Nevada	8,279	1,916	5,452	2,455
New Hampshire	13,915	12,673	9,598	6,586
New Jersey	281,867	259,936	257,563	135,679
New Mexico	10,437	12,929	10,758	12,200
New York	722,146	867,187	681,645	653,705
North Carolina	66,152	42,274	64,998	30,352
North Dakota	2,161	2,352	2,787	2,737
Ohio	253,060	238,538	243,570	188,631
Oklahoma	213,739	135,784	99,486	115,140
Oregon	49,698	53,936	25,776	31,862
Pennsylvania	435,580	431,241	442,728	323,776
Porto Rico	4,500	6,918	1,750	620
Rhode Island	24,096	20,270	22,295	13,249
South Carolina	67,813	132,992	44,806	170,545
South Dakota	12,744	7,187	11,204	6,533
Tennessee	136,191	74,077	85,912	65,246
Texas	428,688	339,964	299,248	327,904
Utah	23,560	4,271	12,529	6,075
Vermont	17,560	2,678	21,257	2,869
Virginia	68,406	77,370	71,683	61,804
Washington	101,062	185,135	47,785	110,948
West Virginia	50,471	56,245	48,025	52,512
Wisconsin	80,278	62,793	77,039	66,531
Wyoming	6,690	3,028	2,755	4,854
Unspecified	.....	427	8,760	25,367
	5,877,356	5,650,831	4,889,372	4,663,359
Foreign countries	73,644	37,169	65,628	23,641
Total shipped from cement plants	5,951,000	5,688,000	4,955,000	4,687,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN JANUARY, 1931

Imported from—	District into which imported	Barrels	Value
Belgium	Massachusetts	15,138	$27,000
	New York	19,047	21,549
	Porto Rico	1,011	1,850
	Total	35,196	50,399
Canada	Maine and New Hampshire	63	183
	Porto Rico	1,011	1,130
	Total	1,074	1,313
Denmark	Porto Rico	30,419	40,012
	Utah-Nevada	1,055	1,900
	Total	31,474	41,912
France	New York	1,942	4,219
Germany	Los Angeles	1,005	1,966
Japan	Hawaii	8,300	8,481
United Kingdom	New York	18,066	24,647
	Grand total	97,057	132,937

RELATION OF PRODUCTION TO CAPACITY

	February		January	December	November
	1930 (*per cent*)	1931 (*per cent*)	1931 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)
The month	41.5	29.4	29.5	38.2	51.7
The 12 months ended	65.6	59.7	60.6	61.5	62.6

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1930 AND 1931 (*In thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1930	1931	1930	1931	1930	1931
January	8,498	6,595	4,955	4,692	27,081	27,606
February	8,162	5,920	7,012	5,048	28,249	28,478
March	11,225	.....	8,826	.....	30,648	.....
April	13,521	.....	13,340	.....	30,867	.....
May	17,249	.....	17,224	.....	30,891	.....
June	17,239	.....	18,781	.....	29,364	.....
July	17,078	.....	20,153	.....	26,289	.....
August	17,821	.....	20,299	.....	23,824	.....
September	16,124	.....	18,083	.....	21,889	.....
October	14,410	.....	15,599	.....	20,697	.....
November	11,098	.....	8,784	.....	23,056	.....
December	8,480	.....	5,688	.....	25,883	.....
Totals	160,905	.....	158,744	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, IN FEBRUARY 1930 AND 1931 (*In thousands of barrels*)

District	Production		Stocks at End of Month	
	1930	1931	1930	1931
Eastern Pa., N. J., and Md	2,415	1,947	1,785	1,665
New York and Maine	344	326	970	1,078
Ohio, Western Pa., and W. Va	1,041	580	1,496	1,465
Michigan	758	380	1,371	1,542
Wis., Ill., Ind., and Ky	1,539	891	1,511	1,558
Va., Tenn., Ala., Ga., Fla., and La	758	749	770	872
Eastern Mo., Ia., Minn., and S. Dak	893	896	728	727
W. Mo., Neb., Kans., Okla., and Ark	796	388	383	791
Texas	451	292	536	348
Colo., Mont., Utah, Wyo., and Idaho	135	160	258	276
California	701	706	1,261	1,146
Oreg. and Wash	177	158	503	484
Totals	10,008	7,473	11,572	11,952

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN FEBRUARY 1930 AND 1931, AND STOCKS IN FEBRUARY, 1930 (*In thousands of barrels*)

District	February						Stocks at End of January
	Production		Shipments		Stocks at End of Month		
	1930	1931	1930	1931	1930	1931	1931
Eastern Pa., N. J., and Md	2,033	1,630	1,419	1,123	6,689	6,054	5,546
New York and Maine	187	151	257	182	1,556	1,957	1,988
Ohio, Western Pa., and W. Va	762	412	651	415	3 401	3 705	3,709
Michigan	543	109	297	220	2,761	2,804	2,915
Wis., Ill., Ind., and Ky	883	427	664	416	4,145	3,966	3,955
Va., Tenn., Ala., Ga., Fla., and La	727	836	881	768	1,598	1,833	1,765
Eastern Mo., Ia., Minn., and S. Dak	748	766	492	377	3,396	3,458	3,069
W. Mo., Neb., Kans., Okla., and Ark	709	263	764	377	1,834	1,952	2,066
Texas	482	286	521	328	778	740	782
Colo., Mont., Utah, Wyo., and Idaho	130	160	104	82	441	488	410
California	755	709	793	602	1,131	938	831
Oreg. and Wash	203	171	169	158	519	583	570
Totals	8,162	5,920	7,012	5,048	28,249	28,478	27,606

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1930 AND 1931

Month	Exports				Imports			
	1930		1931		1930		1931	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	82,387	$293,135	41,199	$115,678	201,609	$207,461	97,057	$132,937
February	64,267	217,798	.....	.....	114,455	119,717	.....	.....
March	117,563	357,896	.....	.....	43,622	59,981	.....	.....
April	57,419	200,217	.....	.....	140,871	178,226	.....	.....
May	57,423	198,170	.....	.....	94,696	111,998	.....	.....
June	82,077	223,639	.....	.....	55,356	74,370	.....	.....
July	47,082	166,577	.....	.....	12,404	20,973	.....	.....
August	49,031	167,579	.....	.....	35,323	39,029	.....	.....
September	46,594	153,384	.....	.....	51,096	59,721	.....	.....
October	62,690	190,305	.....	.....	75,284	84,364	.....	.....
November	50,495	151,555	.....	.....	109,124	125,448	.....	.....
December	38,680	134,260	.....	.....	44,157	59,641	.....	.....
Totals	755,708	2,454,515	.....	.....	977,997	1,140,929	.....	.....

Using Pulverized Iron As Concrete Hardener

(*Continued from page 65*)

complete tables for estimating are easily obtained.

The principle involved in this method of waterproofing can be readily understood. The water in this mixture, when it soaks into the walls, carries these fine iron particles along with it and when they rust they swell up to several times their previous size and seal the pores completely. This rusting process is hastened by the addition of chemicals as otherwise it would be too slow for practical purposes. As iron oxide or rust has little or no tendency to change under normal conditions, it does not deteriorate with age. Consequently a wall or floor waterproofed with this material will remain waterproof permanently. This coating of rust may be covered by a plaster coat troweled on or by a brush coat of pure cement mixed with water in order to restore the original color. Contrary to what might be expected, this undercoat of rust has no tendency to gradually discolor this last coat.

Another use for this iron is for repairing broken walls and floors and filling cracks. In this case, it is not used for its waterproofing qualities but for its ability to create a perfect bond between the old material and the new material in the patch. For the patch itself some iron is mixed in with the usual concrete ingredients. No better evidence can be had of how well the iron works for this purpose than by cementing two pieces of brick together with it. If properly done they cannot be pulled apart.

Still another use for pulverized iron is as a floor hardener. For this purpose slightly larger particles are used. The iron is scattered over the top coat before it has set and then troweled in. This simple and inexpensive treatment not only gives a floor a wearing surface which will stand several times as much hard usage as it otherwise would but makes it practically oil-proof, water-proof and dust-proof as well. In the Merchandise Mart, Chicago, the largest building in the world, one and one-half carloads of this floor hardener were used.

It is said to be of advantage in the waterproofing of slurry tanks and basins, storage silos and sumps.

Production Is Resumed After Winter Shutdown

The Shawneetown, Ill., plant of the Bedford-Nugent Sand & Gravel Co., has resumed operation after a winter shutdown, approximately 30 men being employed. During the closed period a number of improvements were completed.

Traffic News and Comment

Recent I. C. C. Decisions

Dolomite

Rates on raw dolomite from Gibsonburg, O., to Pittsburgh and Connellsville, Pa., Fairmount, W. Va., and Dunkirk, N. Y., are not unreasonable; but the rates to other points are unreasonable to the extent they exceed the following amounts per net ton: to Grafton and Clarksburg, W. Va., $2.10; to Olean, N. Y., $2.15; to Dunkirk. Ind., $1.65; to Anderson, Gas City, Hartford City, Marion, Muncie and Upland, Ind., $1.70; to Kokomo, Elwood and Shirley, Ind., $1.80. Reparation has been awarded and reasonable rates are to be made effective not later than May 27th. I. C. C. Docket No. 21,593, National Mortar & Supply Co. v. Pennsylvania et al.

Gravel

Shipments of gravel from Lilesville (Concrete Siding), N. C., to Marion and Todds Still, S. C., were misrouted by the S. A. L., and the rate charged on shipments to Marion was inapplicable. The applicable rate was found to have been $1.79 per net ton and reparation was awarded. I. C. C. Docket No. 22,688, Southern Paving Construction Co. v. A. C. L. et al.

Lime

The commission has found the rates on lime (common, hydrated, quick or slaked), from various producing points in southern territory and from Genoa, Woodville and Gibsonburg, O., to St. Petersburg and Clearwater, Fla., unreasonable, but not unjustly discriminatory or unduly prejudicial. Reasonable rates to be made effective, not later than May 25, will not exceed those made by the use of scales shown in an appendix to the report. This scale is to be applied the entire distance, the distance to be computed over the shortest routes over which carload traffic could move without transfer of lading. In addition to the main scale, an arbitrary scale is provided showing arbitraries to be added for that portion of the haul south of the S. A. L. from River Junction to Jacksonville, Fla. Reasonable groupings of points of origin may be maintained, basing the group rates on the average distances from all points in such groups. The basic scale is based on a minimum of 30,000 lb., with rates on a 50,000-lb. minimum, 80 per cent of the basic scale. Rates per net ton for a few of the blocks of the scales are shown below. I. C. C. Docket No. 21,323, Dann-Gerow Co., Inc., et al. v. A. C. L. et al.

Column 1. Rates on 30,000-lb. min., single-line haul.

Column 2. Rates on 30,000-lb. min., joint haul.

Column 3. Rates on 50,000-lb. min., single-line haul.

Column 4. Rates on 50,000-lb. min., joint haul.

Miles	1	2	3	4
5	$0.70	$0.80	$0.56	$0.64
50	1.70	1.80	1.36	1.44
70	2.10	2.20	1.68	1.76
80	2.20	2.20	1.76	1.76
100	2.40	2.40	1.92	1.92
200	2.90	2.90	2.32	2.32
320	3.40	3.40	2.72	2.72
400	3.60	3.60	2.88	2.88
600	4.10	4.10	3.28	3.28
800	4.60	4.60	3.68	3.68
1,000	5.10	5.10	4.08	4.08
1,200	5.60	5.60	4.48	4.48
1,400	6.10	6.10	4.88	4.88

Column 5. Arbitraries on 30,000-lb. min., single-line haul.

Column 6. Arbitraries on 30,000-lb. min., joint haul.

Column 7. Arbitraries on 50,000-lb. min., single-line haul.

Column 8. Arbitraries on 50,000-lb. min., joint haul.

Miles	5	6	7	8
60	$0.48	$0.50	$0.38	$0.42
70	0.53	0.55	0.42	0.44
100	0.60	0.60	0.48	0.48
200	0.73	0.73	0.58	0.58
320	0.85	0.85	0.68	0.68
400	0.90	0.90	0.72	0.72
520	0.98	0.98	0.78	0.78

Examiner's Reports

Examiner L. J. P. Fichthorn proposes that the rate on crushed stone from Middlepoint, O., to Grace Siding, Ind., was unreasonable to the extent it exceeded 73 cents per net ton, and that reparation should be awarded. I. C. C. Docket No. 23,234, Grace Construction & Supply Co. v. Indiana Service Corp. et al.

New Complaints Filed

Unreasonable rates on cement from Cement City, Mich., to Chagrin Falls, O., are alleged and reparation is sought in I. C. C. Docket No. 24,268, Consolidated Cement Corp., Chicago, v. C. N. et al.

Rate-Committee Dockets

NEW ENGLAND ASSN.

Crushed Stone

To meet motor-truck competition carriers propose to reduce the rate on crushed stone, c. l. min. wt.[1], from Meriden and Meriden (York Hill Quarry), Conn., to North Windham, Conn., from $1 to 85 cents per net ton. Docket No. 21,886.

Sand and Gravel

To meet barge competition shippers are asking that the rate on common sand and gravel from North Wilgraham, Mass., to Rensselaer, N. Y., be reduced from $1.30 to $1 per net ton. Docket No. 22,019.

TRUNK LINE ASSN.

Cement

Rates on cement from Binnewater, N. Y., to destinations in S. F. A. territory in Ala., Fla., Ga., Ky., La., Miss., N. Car., S. Car., Tenn., and Va., ranging from 18½ cents to 54 cents per 100 lb., are asked by shippers. Proposed rates are made on basis of I. C. C. Docket No. 15,806, and are also comparable with rates from the Lehigh district. Docket No. 26,105.

Crushed Stone

To meet motor-truck competition, carriers propose to reduce the rate on crushed stone, c. l. min .wt.[1], from Port Richmond (Philadelphia), Pa., to Folsom, N. J., from $1.05 to 70 cents per net ton. Docket No. 26,079.

Sand

To meet motor-truck competition, carriers propose to reduce the rate on sand, c. l. min. wt.[1], from Palermo, N. J., to Folsom, N. J., from 15½ cents per 100 lb., to 50 cents per net ton. Docket No. 26,092.

CENTRAL FREIGHT ASSN.

Crushed Stone

Shippers at Delphos, O., are asking that the rate on crushed stone, c. l. min. wt.[1], to Toledo, O., be reduced from 70 cents per net ton to 60 cents, for application via the Nickel Plate direct. Docket No. 27,717.

Gypsum Tile

Carriers propose to establish commodity rates on gypsum tile, c. l. min. wt. 60,000 lb., except where a car of less capacity is furnished, in which case the marked capacity of the car will govern, from E. St. Louis and other Mississippi River crossings to and including, Ill., on traffic originating at Fort Dodge and Gypsum, Ia. At present the sixth-class rate applies on tile (building, hollow), loose or in packages, c. l. min. wt. 36,000 lb. Proposed rates in docket No. 27,714 are:

To	
Louisville, Ky	$2.90
Evansville, Ind.	2.85
Owensboro, Ky.	2.90
Valparaiso, Ind.	2.85
Crown Point, Ind.	2.85
South Bend, Ind.	2.90
Indianapolis, Ind.	2.85
Muncie, Ind.	2.85

ILLINOIS FREIGHT ASSN.

Feldspar

Reduced rate on feldspar (ground), c. l. min. wt. 50,000 lb., from Abingdon, Ill., to various points in Illinois are proposed. A few rates to representative points in Docket No. 4,949-A are:

To	Present	Proposed
Alton, Ill.	$0.14	$0.13
Belleville, Ill.	0.15	0.14
Chicago, Ill.	0.14½	0.13½
Decatur, Ill.	0.13	0.12
Monmouth, Ill.	0.07	0.06½
Robinson, Ill.	0.16	0.15

WESTERN TRUNK LINE

Crushed Stone (Coated)

Mileage-scale rates are proposed on crushed stone, coated with oil, tar or asphaltum, c. l. min. wt.[1], from Des Moines, Ia., to destinations in Illinois, Nebraska, Kansas, Missouri, Minnesota, North Dakota and South Dakota. The scale shown below is proposed for single-line mileages and joint rates

are made by the addition of 30 cents per net ton to these rates. Rates shown are per net ton. Docket No. 7,549.

Miles	Rate
10	$0.96
25	0.96
40	1.07
60	1.19
75	1.30
100	1.42
125	1.53
150	1.76
175	1.88
200	1.99
225	2.11
250	2.22
275	2.34
300	2.57
325	2.68
350	2.80
375	2.91
400	3.03

SOUTHERN FREIGHT ASSN.

Lime

Shippers at River Front Extension and South Knoxville Extension, Tenn., ask a rate of $4 per net ton on chemical lime, c. l. min. wt. 50,000 lb., to Chillicothe, O. At present a combination rate of $5.06 per net ton applies.

Ground Limestone

Reduced rates on ground limestone, c. l. min. wt. 60,000 lb., from Franklin, Tenn., to stations on the N. C. & St. L. are proposed by shippers. Representative rates in Docket No. 54,229, per net ton, are:

To	Present	Proposed
Dickson, Tenn.	$1.83	$1.10
Johnsonville, Tenn.	1.83	1.30
Bruceton, Tenn.	1.94	1.40
Lexington, Tenn.	1.94	1.50
Somerville, Tenn.	2.05	1.80
Murray, Ky.	1.94	1.60

SOUTHWESTERN BUREAU

Cement

Shippers are asking for the establishment on cement and masonry cement, description and min. wt. as per S. W. L. Tariff 168-A, from New Braunfels, Longhorn, Cementville, Houston, Harrys, Eagle Ford and other Texas cement producing points as per S. W. L. Tariff 168-A to St. Louis, Kansas City and Memphis territories on and west of the Mississippi River, as defined in S. W. L. Territorial Directory 1-H; also to points in Arkansas, Oklahoma and Louisiana on and west of the Mississippi River, rates based on scale 3, I. C. C. Docket 15,151, but not to increase any rates which are now in effect. Docket No. 22,372.

Sand and Cement

It is proposed to establish a rate of 32 cents per 100 lb., on mixed sand and cement, in bags, c. l. min. wt. 40,000 lb., from Chicago, Ill., to Oklahoma City, Okla. A shipper is interested in the mixing of sand and cement and shipping the commodity in paper bags to various points, each bag weighing approximately 80 lb., the value of which is about 35 cents. There is no specific rating applicable at present other than that applicable under Rule 10 of the Western Classification which provides for the rating of the highest rated article in the mixture. The interested shipper has approached the Classification Committee in an endeavor to establish specific ratings on this commodity, but has also requested the publication of commodity rates. The proposed rate to Oklahoma City is figured between that applicable on sand and that applicable on cement. Docket No. 22,389.

BUILDING MATERIAL PRICES, FEBRUARY 1, 1931

Data collected by the Bureau of the Census and prepared by the Division of Building and Housing, U. S. Bureau of Standards.

City	Portland Cement (bbl.)	Gypsum Plaster (ton)	Gypsum Plaster Board (1,000 sq. ft.)	Lime (ton)	Building Sand (cu. yd.)	Crushed Stone (ton)	Roofing Slate (100 sq. ft.)
Akron, O.	$2.67	.....	.....	$18.00	$1.85	$1.85	.....
Albany, N. Y.	2.97	$17.10	$24.75	18.00	.....	.....	.....
Atlanta, Ga.	2.85	19.00	.....	17.50	3.38	3.25	.....
Baltimore, Md.	2.40	15.00	.....	13.50	2.50	2.75	$10.00
Buffalo, N. Y.	2.95	16.00	21.00	18.00	2.50	2.05	12.00
Canton, O.	2.95	15.00	.....	16.00	2.50	3.00	.....
Chicago, Ill.	2.40	16.00	21.00	17.00	2.00	2.00	.....
Cincinnati, O.	2.94	.....	24.75	14.40	2.63	2.55	.....
Cleveland, O.	2.40	14.50	22.00	12.00	1.95	2.70	16.00
Columbia, S. C.	2.35	14.40	35.00	12.00	1.50	2.75	14.00
Columbus, O.	2.70	15.00	.....	14.00	.....	2.25	11.00
Denver, Colo.	2.20	18.00	.....	22.00	1.35	1.50	.....
Des Moines, Iowa	3.08	.....	.....	20.00	1.10	.....	.....
Detroit, Mich.	2.60	.....	25.00	14.80	2.03	1.95	.....
Erie, Pa.	2.40	16.00	22.50	19.00	2.00	.....	.....
Fairmont, W. Va.	2.80	18.00	35.00	16.00	3.15	3.50	13.00
Grand Forks, N. D.	3.00	20.00	.....	25.00	2.60	.....	.....
Haverhill, Mass.	2.80	18.50	25.00	20.00	.....	.....	.....
Kansas City, Mo.	2.50	17.00	25.00	.....	1.70	2.25	17.00
Lansing, Mich.	2.90	16.50	.....	22.00	2.20	.....	.....
Los Angeles, Cal.	2.30	15.20	.....	28.50	1.85	1.90	.....
Louisville, Ky.	2.52	16.00	.....	15.50	2.20	2.43	15.00
Milwaukee, Wis.	2.20	.....	25.00	15.00	1.50	1.50	.....
New Bedford, Mass.	2.65	17.50	27.00	18.50	1.75	3.00	.....
New Haven, Conn.	2.90	.....	.....	20.00	1.25	2.25	.....
New London, Conn.	2.80	18.00	25.00	26.00	1.50	2.40	.....
New Orleans, La.	2.20	18.00	.....	.....	2.35	.....	10.50
Paterson, N. J.	2.40	17.50	25.00	18.00	1.50	2.10	14.00
Philadelphia, Pa.	2.30	17.50	.....	14.50	1.75	2.60	9.75
Poughkeepsie, N. Y.	2.18	.....	.....	.....	2.25	2.00	.....
Richmond, Va.	3.10	20.00	31.00	17.50	1.95	2.45	13.00
Rochester, N. Y.	3.25	17.00	22.00	20.00	1.75	2.40	12.00
Rockford, Ill.	2.90	16.00	25.00	20.00	1.60	1.15	.....
St. Louis, Mo.	2.15	18.00	.....	18.00	1.35	1.00	13.00
St. Paul, Minn.	2.45	18.00	.....	18.00	2.23	1.75	13.00
Saginaw, Mich.	2.60	17.00	25.00	18.00	2.50	3.25	14.40
San Antonio, Tex.	2.60	19.15	.....	20.00	2.25	2.35	.....
San Francisco, Cal.	2.30	19.90	.....	22.50	1.40	1.60	16.00
Scranton, Pa.	2.80	19.00	.....	20.00	3.25	.....	.....
Seattle, Wash.	1.75	20.00	.....	22.00	1.40	1.90	.....
Shreveport, La.	3.20	22.00	.....	.....	2.00	4.75	15.00
Sioux Falls, Ia.	3.00	15.00	.....	24.00	1.25	2.25	.....
Syracuse, N. Y.	3.00	17.00	22.50	18.00	2.00	2.25	12.00
Tampa, Fla.	3.00	.....	.....	24.00	1.50	4.00	.....
Terre Haute, Ind.	2.85	18.00	28.00	18.00	1.65	3.25	13.50
Toledo, O.	3.00	14.50	20.00	12.00	2.00	2.50	.....
Trenton, N. J.	2.40	17.50	26.00	18.00	1.50	2.10	14.00
Tucson, Ariz.	3.37	17.10	.....	30.00	1.25	2.25	.....
Washington, D. C.	2.33	20.00	25.00	13.00	.....	.....	.....
Waterbury, Conn.	3.00	20.00	30.00	20.00	1.35	2.45	15.00
Yonkers, N. Y.	2.56	.....	.....	17.00	2.25	3.25	.....
Youngstown, O.	2.60	15.00	.....	15.00	3.40	2.50	14.00

[1] The proposed carload minimum weight will be 90 per cent of the marked capacity of the car except, when car is loaded to full cubical or visible capacity, actual weight will apply.

Questions and Answers

Question.—Before making a recent shipment, a local railroad agent was asked for the rate which was inserted on the bill of lading. After delivery, our customer wrote, claiming that his agent had raised the rate and he had to pay additional charges. We immediately asked our local agent to confirm the rate he quoted, which he did. Since that time he has received a correction from the agent at destination and has found that the rate quoted was cancelled by the higher rate in a supplement which he overlooked. Can we collect the additional charges by filing an overcharge claim? E. C. K.

Answer.—The higher rate shown in the supplement is the lawful rate and there is no overcharge unless a lower rate is found in an effective tariff. Sec. 6 of The Act to Regulate Commerce says, "Nor shall any carrier charge a greater or less compensation than the rate specified in the tariffs which are effective at the time." The commission in the case of A. J. Poor Grain Co. v. C. B. & Q. et al., 12 I. C. C. 418, 422, has stated, "Regardless of the rate quoted or inserted in the bill of lading, the published rate must be paid by the shipper and actually collected by the carrier."

Hoist and Derrick Firm Adds New Distributors

The Lidgerwood Manufacturing Co., Elizabeth, N. J., hoist and derrick manufacturers, has been strengthening its distributor organization. Among the distributors recently added are Hedge & Mattheis Co. of Boston, the Brown-Bevis Co. of Los Angeles, the Edward R. Bacon Co. of San Francisco, Funkhouser Equipment Co. of Kansas City and the Thorman W. Rosholt Co. of Minneapolis. Other additions are to be announced in the near future.

The Chicago office of the Harnischfeger Sales Corp. has been moved from 205 West Wacker Drive to the Civic Opera Bldg., 20 North Wacker Drive.

Review of Foreign Practice

Continue Studies Upon Lime-Sulphate Hydrates

It is almost one hundred years since the first published reference to the existence of a hemi-hydrate of calcium sulphate was made, and in the meantime numerous investigations have been made on the process by which this form is produced from the natural gypsum and the way it behaves. The authors review the literature carefully, particularly that bearing on their own investigations, and report tests that among other things bear out the conclusions of Linck and Jung of a periodic transition from the double to the hemi-hydrate, although finding the critical temperature 20 deg. lower—a variation explained by a difference in time allotted to the investigation of the materials under test.—F. Krauss and G. Joerns in *Tonindustrie-Zeitung*, 54:1467-8 and 1483-4, Nov. 24 and 27, 1930.

Use of Producer Gas in Firing of Gypsum Kilns

In the customary gypsum-calcining kettles or rotary kilns, in which the gypsum comes into direct contact with the hot gases, as in such related processes as marble-cement kilns or estrich kilns and the like, the fuel is burned on grates and there is always an excess of air on account of the sluggish combustion and bad mixing of air and fuel, resulting in a comparatively low flame temperature; furthermore the opening of the fire doors for throwing on fresh coal, raking, etc., causes wide fluctuations in the temperature. These conditions, bad alike for the calcining process and for the utilization of the fuel, are eliminated, according to this author, by firing with gas from producers, for which the writer claims the advantages of regulating the air requirement almost to the theoretically required minimum; achievement of much higher temperatures; higher fuel economy; greater cleanliness; sure and rapid adaptation to all fluctuations of load, and greater production from the kilns themselves because disturbances and fluctuations in the firing are done away with.

Producer gas is formed when air and steam are passed through an incandescent layer of fuel, giving rise to a mixture of combustible gases, principally carbon monoxide, hydrogen and methane, along with some carbon dioxide and nitrogen as "ballast" or inert ingredients. The most modern and efficient producers are equipped with revolving grates, and a type widely used in Europe is shown in the illustration. In this producer the ash-bowl alternates with the grate in a slow rotation so that ash is automatically removed, and the movement of the eccentric grate loosens the layer of fuel and prevents caking, so that stoking is reduced to a minimum. This machine produces gases of uniform composition and highest heating value, with a thermal efficiency reaching 90 per cent. The shell of this producer forms a water-chamber which serves not only as a cooler for the producer but also to heat the water for the steam and air blown through the grate.

The first German gypsum plant equipped for gas firing was an installation made in 1927 by the Firma L. Roddewig, Badenhausen bei Osterode.

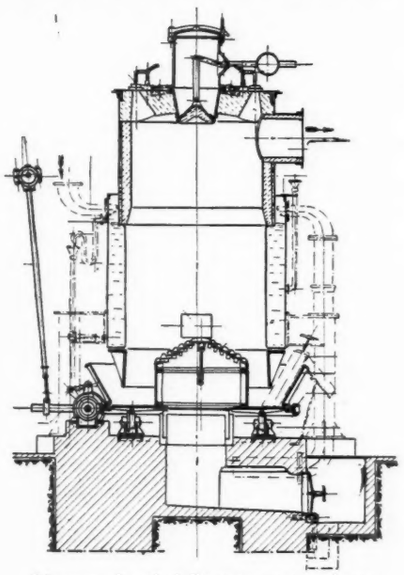


Diagram of typical European gas producer.

This installation consists of a producer, a dust collector and a hot gas conduit carrying the gas to the cast-iron burner. The author also mentions other installations in allied industries and gives comparative figures on the consumption of fuel and production of heating energy.—Ing. Walter Kirnich in *Tonindustrie-Zeitung* 54:1343-5 and 1374-6, Oct. 23 and 30, 1930.

German Requirements of High-Strength Cements

Since a decree of the German minister of commerce in 1927 the expression "hochwertiger Zement" (super-cement or high-test cement) has had the definite meaning of a cement corresponding in all respects to the German standards for Portland and exceeding it both in its higher strengths and its high early strength; it refers thus to super Portland, iron-Portland and blast-furnace Portland cements, but not to natural cements or to alumina or fused cements. The expression "hochwertig" is not adequate, but it has become well established by usage, and at least is preferable to the Austrian term "fruehhochfest" ("high-early-strength") because the latter expresses only one of the characteristics of these cements, and the term itself hardly suits the German "sprachgefuehl."

The manufacture of super cements involves particularly fine raw and finish grinding and careful burning, and thus requires heavier plant investments and operating costs than standard Portland. The strength of cement can also be increased by increasing the lime content, but only at the risk of approaching the limit of soundness, and in later years the standards for ordinary Portland have come so close to this limit that this scarcely applies to the super cements. Other variations in chemical compositions sometimes have similar effects. Kuehl has developed cements with high alumina contents, which in spite of their tendency to form rings in the kilns are easy to grind and can be used in countries having a bauxite supply; there are also high-test cements with high-silica contents, but these are very hard to grind and to burn. The manufacture of cements with the addition of fluorspar or similar materials has likewise been met with practical objections.

It has generally been believed that the manufacture of the high-test cements required a rotary kiln, but improvements in automatic shaft kilns have made it possible to use them for this process. In such an operation the dry raw mix must of course be thoroughly mixed to insure perfect homogeneity.

In view of the difficulties of burning and grinding in the production of these cements it has been natural to try to raise the strength with admixtures added after the grinding, and as admixtures influencing the setting time are limited to 3 per cent, materials of great activity are required. According to Kuehl's investigations, the most active substance for this purpose is calcium bromide, but because of the cost of this material those commonly used are gypsum and calcium chloride.

Alumina cement forms an entirely different product from the high-test cements discussed, although it also is characterized by high early strength and reaches high ultimate strengths. It has alumina contents of 35 to 45 per cent as against 29 to 45 per cent lime, and is burned at such high temperatures that it fuses. Only one plant in Hungary manufactures alumina cement by the clinkering process. This cement is particularly expensive in Germany because of the cost of the principal raw material, bauxite, which must be imported.—Dr. Karl A. Goslich in *Tonindustrie-Zeitung*, 55:48-51, Jan. 12, 1931.

Recent Patents

AMERICAN

Cement

Method of improving the properties of Portland Cements. Emil Reubke, Bitterfeld, Germany, assignor to I. G. Farbenindustrie. No. 1,791,684.

Cement-waterproofing solution. Sam C. Bennett, Birmingham, Ala. No. 1,791,704.

Process of manufacturing Portland Cement. James H. Colton, Berkeley, Calif., assignor to Pacific Portland Cement Co. No. 1,791,800.

Method of feeding cement material to kilns. Povl T. Lindhard, Brooklyn, N. Y., assignor to F. L. Smidth & Co., New York, N. Y. No. 1,793,499.

Concrete

Blade for concrete-mixers. Clarence M. Tuck, Seattle, Wash., assignor to Morris & Boogher, Inc. No. 1,791,880.

Process of producing cellular or porous concrete. Emirk I. Lindman, Stockholm, Sweden, assignor to Aerocrete Corp., New York, N. Y. No. 1,791,820.

Crushing and Grinding

Cone crusher. Edgar B. Symons, Los Angeles, Cal., assignor to Nordberg Mfg. Co., Milwaukee, Wis. No. 1,791,584.

Crushing machinery. Herbert F. Campbell, Philadelphia, Pa., assignor to Pennsylvania Crusher Co., New York, N. Y. No. 1,791,712.

Disintegrating apparatus for road-surfacing materials. Bert M. Fordyce, Anaheim, Cal. No. 1,791,865.

Single-roll grinding mill. Alfred E. G. MacCallum, London, England. No. 1,794,236.

Excavating

Excavating machine. Philo A. Orton, Chicago, Ill., assignor to Orton Crane & Shovel Co., Huntington, Ind. No. 1,793,507.

Dumping device for back-digging shovels. Mitchell T. Fyksè and Roger S. Hoar, South Milwaukee, Wis., assignors to Bucyrus-Erie Co., same place. No. 1,794,164.

Material Handling

Loading apparatus. Charles E. Davis, Davenport, Fla., assignor to Goodman Mfg. Co., Chicago, Ill. No. 1,791,662.

Apparatus for handling loose materials. Alfred B. Esseltine, Chicago, Ill., assignor to Goodman Mfg. Co., same place. No. 1,791,665.

Trolley for bucket conveyors. Henry C. Sheldon, Chicago, Ill., assignor to Gifford-Wood Co., Hudson, N. Y. No. 1,791,844.

Bucket for material-handling plants. Azzel C. Bennett, Hudson, N. Y., assignor to Gifford-Wood Co., same place. No. 1,791,882.

Miscellaneous

Apparatus for the continuous weighing of material. Robert T. Knapp, Pasadena, Cal., assignor to Riverside Cement Co., Los Angeles, Cal. No. 1,793,701.

Clamshell bucket. George F. Thompson, Erie, Pa., assignor to G. H. Williams Co., same place. No. 1,794,257.

Screening

Screen for ball mills. Harry S. Lee, Plymouth, and Webster L. Kaiser, River Rouge, Mich. No. 1,793,495.

FOREIGN

Cement and Concrete

Cement made from blast-furnace slag and Portland cement. Albrecht Duemmler. German 518,905.

Process for the production of masses that harden hydraulically. Charles Ernst Kraus. German 520,053.

Process for the production of porous masses from mineral substances capable of setting. Dr. Julius Meyer. German 520,506.

Process for the fusing of cement in shaft kilns with mixed firing. Sefan Kohut. German 520,211.

Crushing and Grinding

Grinding mill. The Fuller Lehigh Co. (Ralph Martin Hardgrove.) Canadian 308,718.

Feed control for mills. The Fuller Lehigh Co. (Ralph Martin Hardgrove.) Canadian 308,719.

Coal breaker. Frank Pardee. Canadian 308,822.

Grinding mill. The International Pulverizing & Grinding Machines (Parent) Corp., Ltd. (Paul Kittay.) Canadian 309,065.

Device for separating iron and other foreign material in crushing machine. Ernst Curt Loesche. German 518,833.

Centrifugal mill. Adolf Steinbrueckner.

Apparatus for grinding cement and similar materials with introduction of a cooling substance. Carl Pontoppidan. German 518,308.

Drilling

Drive for compressed-air drilling device. Worthington Pump & Machinery Corp. German 518,913.

Hanging device for hammer drill. August Foss. German 519,309.

Device for rock drill. Worthington Pump & Machinery Corp. German 518,914.

Pneumatic telescoping device for drill. Bruno Matthes. German, 520,450.

Holding arm for drilling hammer. Walter Loth and Karl Loth jun. German 520,371.

Drying

Apparatus for drying and heating crushed stone and the like. Oesterreichische Bamag - Buettner - Werke Akt.-Ges. German 520,439.

Process for improving coal by means of drying. Boehmische Handelsgesellschaft. German 520,369.

Apparatus for the drying of air or other gases. Alec Edward Sherman. German 520,055.

Firing

Method of burning pulverized fuel. The Fuller Lehigh Co. (Ervin George Bailey.) Canadian 308,716.

Pulverized fuel burner. Peabody Engineering Corp. (Horace T. Dyer.) Canadian 308,736.

Gypsum

Wall board or lath. The Gypsum, Lime & Alabastine, Canada, Ltd. (Leo Vance Robinson.) Canadian 309,060.

Kilns

Tunnel kiln. Vojtech Lastovicka. Canadian 308,981.

Rotary kiln for handling cement, ore or the like, in which the cooler forms with the kiln a continuous tube. G. Polysius Akt.-Ges. German 520,212.

Lime

Apparatus for hydrating lime in a trommel. Spoerri & Co. German 519,007.

Material-Handling

Conveyor. The Burlectas, Ltd. (Arthur Guy Enock.) Canadian 308,852.

Connection for shaking conveyor. Bela Lesko. German 520,441.

Belt conveyor for distribution of bulk materials. "Miag" Muehlenbau und Industrie Akt.-Ges. German 520,358.

Loading machine. Hermann Rass. German 520,359.

Mixing

Concrete mixer. Karl Piehler. German 520,198.

Screening and Separating

Removal of impurities from sand, clay, etc. Chance Brothers & Co., Ltd. (John English.) Canadian 308,032.

Unclassified

Manufacture of concrete aggregate from finely crushed clay and cinders. John Eckert Greenawalt. Canadian 308,804 and 308,805.

Process for working the silicate-containing fine constituents of household or industrial dust. Musag Gesellschaft fuer den Ban von Muell- und Schlacken - Verwertungsanlagen Akt. - Ges. German 518,906.

Process for hardening artificial or natural stone. Kleinberger & Co. Akt.-Ges. German 519,129.

Process for production of a tampable mass from lime, marl and bitumen, particularly for road surfaces and the like. Hermann Heinrich Schroeder. German 519,031.

Cable clamp. Henry C. Fiege. Canadian 308,973.

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Legal Information for Operators

Court Defines Owner as One in Legal Possession

Although many controversies involve the legal meaning of "owner" in mechanic's-lien laws, the law is generally settled that an owner is the party in legal possession of the real estate when a contract is made for improvement of the property.

For illustration, in Freiden v. Pecos Co., 290 Pac. 797, it was disclosed that the purchaser of a lot erected a building on it and later defaulted in paying for the lot. The seller of materials, including rock, sand and cement, filed a mechanic's lien. The owner of the lot, who repossessed it from the purchaser, contested the validity of the lien. It is interesting to observe that the Court held the lien valid, saying:

"We used the word 'owner' in the same sense as it is used in our mechanic's lien statute. It does not necessarily refer to the holder of the legal title to the property improved. It may have reference to one whose interest is less than a fee-simple estate, such as a lessee or a conditional vendee in possession. It means the party in interest who is the source of authority for the improvement. One who deals with such a party directly is contracting with the 'owner' and is not a subcontractor, but is an 'original contractor.' "

Also, in Gray v. Pumice Stone Co., 110 P. 603, it was held that one who deals directly with the owner of the property is an original contractor.

Allowance for Damages Denied Quarry Promoter

It is well settled that a person who fully completes obligations assumed under a contract may compel the other party to fulfill the contract, or he may recover damages. However, it is important to know that the circumstances may be such that, although the party who intends to file suit believes that he has fulfilled his obligations, yet he may not be justified in filing legal action against the other party.

For illustration, in Hupp v. Lawler, 288 Pac. 801, it was disclosed that the defendant owned a parcel of land on which was located an undeveloped granite quarry. Being without money and desiring to make the quarry income-producing, he entered into a contract in writing with the plaintiff whereby the latter was employed to organize and promote a corporation for the purpose of taking over the land and developing the quarry. In consideration of his services Hupp was to receive an undivided one-half of the land and the two men were to own a majority of the capital stock of the corporation to be issued to them in equal shares, after they had conveyed the land to the corporation.

Pursuant to the agreement Hupp devoted five months of his time and expended over $3,000 in organizing and promoting the corporation. He secured manufacturers and builders as customers for the granite who agreed to buy the product. He also secured reports from granite experts, and sought and secured many persons willing to invest in the enterprise. When the work had thus progressed Lawler, the owner of the land, decided that he did not desire to complete his obligations. Therefore, Hupp, without completing his part of the contract, filed suit asking the Court either to compel Lawler to fulfill his obligations or allow damages amounting to $10,000 and expenses of $3,000. Since Hupp did not prove that he was damaged to this extent, the Court held that he was not entitled to relief and explained the law, as follows:

"We do not believe the contract between the parties is subject to specific performance. Nor can we hold that the mere organization of the corporation is such a degree of performance on the part of the appellant (Hupp) as would entitle him to a deed to one-half of the land; especially is this so when the record shows that not a drill or a pick has ever been applied to the granite quarry. . . . It is difficult to see how $3,000 could have been expended in 'paying the costs and expenses incidental to said promotion and organization,' and impossible to determine in what manner appellant (Hupp) was damaged in the sum of $10,000."

Policy of Lien Laws Is to Guarantee Payments

The policy of the lien law is to protect subcontractors and laborers against loss for labor done and materials furnished in building, repairing, or altering any house or other improvement on real estate, to the extent of the balance due the original contractor at the time of notice to the owner of claims therefor.

Generally speaking, a material man is entitled to recover payment against an owner who makes payments to a contractor after the former sends notification to the owner of the amount due for building materials. This important rule of the law is applicable although work for which payments were made to the contractor was done after notice was sent to the owner by the material man.

For example, in Beeson Co. v. Burtner, 155 S. E. 733, it was disclosed that on a certain December 20 a material man sent notification to an owner that the contractor owed money for materials used in the construction work. Afterward the contractor performed other work and the owner did not retain the amount due the contractor for this latter work. In holding the material man's lien effective with respect to all money due the contractor from the date notice was sent, the Court said:

"It is immaterial whether the contractor had been paid up in full for work done to the time notice was filed by the material man. The fact that he continued the work under the same contract will make the fund thereafter earned subject to the material man's lien. . . . The fact that the work for which these payments were made was done after notice is immaterial. The work was done by the contractor, under the contract, and the payments were made for this work."

Complainant Must Prove Implied Interpretation

Generally speaking, if a person contends that the terms of a contract should be construed according to unusual rules, or different from the ordinary meaning of the law, he is bound to prove his assertions. If he fails to do so the Court will interpret the contract in view of the meaning which would have been intended by ordinarily prudent and reasonable persons.

For illustration, in Ricci v. McGovern, 149 Atl. 860, it was disclosed that a seller furnished a contractor with a large quantity of stone which was used as riprap on the municipal causeway through its reservoir. It was agreed that the seller should be paid $1 a cubic yard for wall stone and $1.25 a cubic yard for quarry stone. A dispute arose from a disagreement as to the method by which the yardage of the stone was to be determined. The seller claimed that it was to be determined by measuring the stone after it had been placed in position on the slope of the causeway, and the contractor contended that it was to be determined by keeping account of the number of truck loads on the basis of three cubic yards of stone to each load. The contractor testified that many of the larger stones were purposely broken to small pieces by the seller's employees while being placed on the slope of the causeway, and that this breakage increased the yardage of the stone about 20 per cent more than it was when the stone was on the trucks.

Since the seller failed to prove that the original agreement provided that payment should be based upon measurement on the causeway, and also since it was shown that he had accepted $10,003 payment based on the price per load, the higher Court held the contractor entitled to pay for the stone on the basis of three cubic yards to each motor-truck load.

Insurance Problems Discussed

Choosing an Agent

IF Bill Jones is the name of your insurance agent, why do you buy your insurance through him instead of through somebody else? Does he belong to the same lodge? Did he get you a good loan at the bank? Or, for what other reason did you single him out to handle this service for you?

The reasons why a producer chooses a certain insurance agent are many and complicated. Some operators buy from their best friends; others always from strangers. Some buy on price alone; others put the claim service ahead of price. Friendship usually is a factor in the relationship. But, except for a few of the fast-disappearing "handshakers," the friendship comes in not because it means business for the agent. It comes in because a true friend should and will work harder to keep your policies in order and to get prompt settlement of claims than a stranger will.

Your Choice Limited

The number of insurance men you know personally is so limited that you can hardly hope to get a comprehensive view of agents in general. It is seldom possible to get statistics on so intimate a subject. One of the large insurance companies has just completed a study along this line, interviewing two hundred and fifteen property owners in different localities. The following paragraphs combine the results of that study with the opinion of this department. By thus checking the experience of other business men, you will be able to determine whether you are receiving satisfactory personal service from your agent or broker.

The principal questions which have a bearing on the choice of a fire-insurance agent run about as follows:

1. Which of these characteristics controlled your present choice:
   - (a) Specialized ability?
   - (b) Friendship?
   - (c) Advertising?
   - (d) Reputation?
   - (e) The insurance company behind the agent?
2. Would a new salesman, not your regular agent, with a new form of policy receive your attention and your patronage?
3. Do you take regular inventories in your business?
4. What do you know about the "side lines" (insurance other than fire coverage)?

Here are the answers to the first question, showing how two hundred property owners chose their present insurance agents:

	Per cent
1. Specialized ability and training	53
2. Friendship	43
3. Advertising	20
4. Reputation	21
5. Company behind the agent	17

In about one-half the replies, the insureds named two reasons as influencing their choices.

That specialized ability and training are the biggest factor shows that insurance is a financial field where the property owner needs expert advice. When you make allowance for the rather large amount of insurance which is treated as a sort of bonus (such as fire insurance on buildings placed by the holders of mortgages and contract bonds dictated by politicians) it is evident that, whenever possible, business men demand competent personal service on rates and losses.

Friendship is often mentioned, but only in conjunction with some other reason. It is widely and properly assumed that a friend will look out for your interests more carefully than a stranger will.

Company Disregarded

The biggest surprise in the list is that only 17 per cent stress the importance of the company which the agent represents. That is quite a tribute to the integrity of the majority of insurance agents. The salesman for a mutual insurance company, being a direct employee, is likely to put all the emphasis on his employer. But the regular agents, who write the vast majority of all fire and liability insurance in the United States, hold themselves free to place business in various companies in order to get the best deal on each case and property owners rely more on the expert judgment of the agent than on a first-hand investigation of every company.

Most executives are quite open to new ideas about insurance. In the national survey referred to above, eighty-two per cent of those answering stated that they would give a hearing to a new agent who offered a new form of policy.

New Ideas Welcome

When it comes to placing insurance based on new proposals from strangers, the opinions are more evenly divided. Approximately one-half believe that the new man is entitled to the full reward for his ideas, but the other one-half, while recognizing some obligation to the new man, feel that insurance should be placed only with the regular agent to whom they look for daily service. Of course, this is a point where it is hard to generalize. Every case that comes up must be settled on its individual merits. If the new proposal discloses that the old agent has been "asleep at the switch"—has been ignorant or careless to the point where you were not safely protected—your confidence in him will be shaken. If the new proposal, however, represents an improvement that is not fundamental, you should think twice before letting the new man in. For the true service of a local agent is not the delivering of a policy but the day-to-day service to your plant.

Regular Inventories

In the investigation to which we have referred, only eighty-three per cent of the firms questioned take regular inventories. The list included some rather small concerns, to be sure, but, in these days of compulsory tax returns, it is almost incredible that seventeen out of one hundred businesses should operate without efficient inventories. Since a good inventory is an essential for placing insurance properly, it seems logical to mention it in connection with the agency question.

Suppose your plant should burn down and the adjuster should come along and say, "Mr. Blank, I believe you are an honest man, and so, instead of arguing this loss with you, I am simply going to pay you for every item that you list in writing." Without an inventory you could not do yourself justice. I saw one loss settled without an inventory where the insured put down everything he could think of and the adjuster voluntarily added five per cent to the total. Yet the insured told me, six months later, that, in spite of the adjuster's liberality, he had cheated himself out of many items.

"Side Lines"

In connection with this subject it is interesting to note the widespread ignorance of general insurance possibilities. Out of 215 insureds, 176 had never heard of rent insurance, 167 had never heard of aircraft damage, 111 had never heard of windstorm insurance, 175 had never heard of explosion insurance, and 168 had never heard of business interruption insurance.

All these subjects have been fully covered in recent numbers of PIT AND QUARRY. The important point about them is not that you might perhaps want to carry all of them, but rather that, under certain circumstances, some one of them may be more vital to you personally than any other kind of insurance; and it should be part of your executive work to become informed on all angles of insurance.

Handles Canadian Sales for U. S. Manufacturer

Mussens, Ltd., of Montreal, recently appointed Canadian distributors by the Good Roads Machinery Co., is now furnishing Good Roads products—which include Good Roads and Climax crushing equipment—to operators throughout the dominion.

New Machinery and Supplies

New Diesel Locomotive in 12-to 14-Ton Model

A recent addition to the line of Plymouth locomotives manufactured by the Fate-Root-Heath Co., Plymouth, O., is the Model JLD 12- and 14-ton Diesel.

This new model, illustrated here, employs the Buda M. A. N. 4-cycle Diesel engine, developing 94 horsepower. The transmission is of massive construction, designed not only for the power it must transmit but to give exceptionally long life and freedom from breakage.

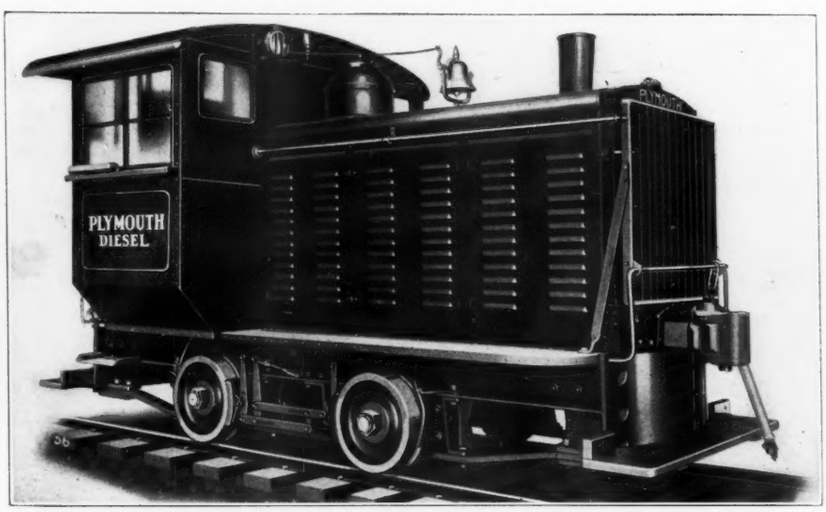
The transmission of power from the final driveshaft in the transmission to the axles is through four sprockets and two short chains. The driving sprockets are heat-treated steel forgings. The driven sprockets on the axles are steel forgings of the split-plate type, bolted to solid centers pressed on the axles. This construction permits quick replacement of worn sprockets. The chains are of the roller type, greatly oversize, short in length, and operate over large diameter sprockets. The sprocket centers are near the same horizontal plane. These features insure long life for both sprockets and chains.

The locomotive frame is constructed with cast-steel end bumpers and rolled-steel girder and bar sides. Axle boxings are carried on chilled-iron slides, which are bolted to slide holders mounted between the girder beams and forged bars which make up the locomotive side frame. The girder beams are milled square at each end, pulled up to a finished seat on the end bumpers, then drilled and reamed for drive-fitted bolts. This construction gives a heavy end section to withstand shocks, and the strength and elasticity of the steel tying members to absorb these shocks.

The springs are alloy steel, semi-elliptic, designed to give the utmost flexibility, and fitted with a cross-equalizer which insures easy riding and the ability to stay on rough tracks.

Solid, rolled-steel wheels 24-in. in diameter are standard equipment. The axles are fitted with Timken tapered roller bearings.

The tractive force at 2¼ mi. per hr. is 12,533 lb. The standard model has four speeds—2¼, 3⅝, 7½ and 12 mi. per hr. The special model has these ratings—3, 5, 10¼ and 16¼ mi. per hr.

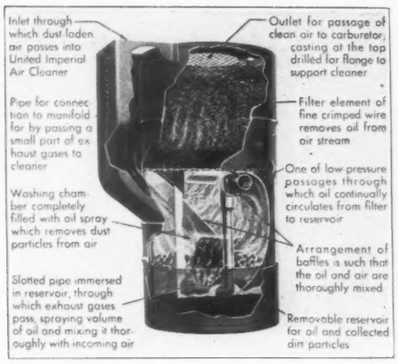


The model JLD Diesel-driven locomotive.

Improved Oil-Type Air Cleaner Aids Operation

Utilization of exhaust gases as a means of operation is a distinctively new feature incorporated in the United Imperial air cleaner recently developed by the United Air Cleaner Corp., Chicago, Ill., and designed especially for the protection of internal-combustion engines used on tractors, trucks, excavators, compressors and other engine-driven equipment exposed to severe dust and dirt conditions.

As shown by the accompanying illustration, the new cleaner is of the oil type, a removable compartment at the bottom being provided for the oil reservoir. Immersed in the oil is a short section of slotted pipe which is connected to a tap on the manifold so that a small amount of the exhaust gases is by-passed to the cleaner. As soon as the engine is started, the heated gases emitted through the slot cause turbulence in the oil, with the result that the washing chamber immediately above the reservoir is completely filled with an oil spray. Outside air admitted to this chamber must pass through the spray and be deflected by a series of specially shaped


Inlet through which dust-laden air passes into United Imperial Air Cleaner
Pipe for connection to manifold for by passing a small part of exhaust gases to cleaner
Washing chamber completely filled with oil spray which removes dust particles from air
Slotted pipe immersed in reservoir, through which exhaust gases pass, spraying volume of oil and mixing it thoroughly with incoming air
Outlet for passage of clean air to carburetor, casting at the top drilled for flange to support cleaner
Filter element of fine crimped wire removes oil from air stream
One of low-pressure passages through which oil continually circulates from filter to reservoir
Arrangement of baffles is such that the oil and air are thoroughly mixed
Removable reservoir for oil and collected dirt particles

Cutaway view of air cleaner.

baffles, the combined action of the oil spray and the baffles resulting in thoroughly washing the air and removing the dust particles. The oil-laden air then passes through a filter compartment packed with fine crimped wire, which removes the oil and completes the cleaning process.

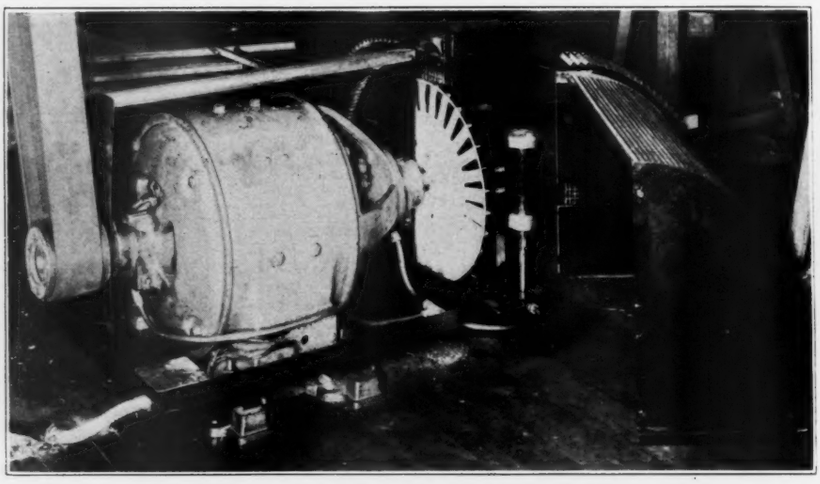
Between the washing chamber and the outer shell of the cleaner are passages which are out of the path of the air passing through the cleaner, and which permit a continuous circulation of oil.

There are numerous operating advantages claimed for the new cleaner. The fact that the exhaust gases are utilized for creating the oil spray contributes to the efficiency and dependability. Regardless of outside temperatures and engine operating speeds, the heated exhaust gases quickly reduce the viscosity of the oil and bring it to the necessary temperature for cleansing purposes. Proper operation of the carburetor is not subjected to interference, it is said, and the efficiency of the engine is not appreciably impaired at any operating speed. Use of the exhaust gases also insures a positive circulation of oil in the cleaner, which washes the various parts and causes the dust particles to collect at the bottom of the oil reservoir, thus making the device self-cleaning. Ordinary crankcase oil can be used and changed as often as required.

A complete range of models is made for application to various sizes of engines. Detailed information is given in Bulletin No. 101, copies of which can be obtained from the manufacturer on request.

Sheet-Metal Inclosures Guard Electric Motors

Inclosures of sheet metal for open types of electric motors are furnished to individual specifications by the Daun-Walter Co., 506 North Water St., Milwaukee, Wis. These inclosures have been used in various industries for several years with unfailing sat-



Inclosure being assembled around a motor.

isfaction. They eliminate troubles arising from dust and moisture, and dispose of the heat generated in the motors, keeping temperatures down to N. E. M. A. standards.

These inclosures reduce hazards of explosion or fire where combustible dusts prevail, reduce insurance rates, reduce commutator troubles, and permit the location of motors in the most desirable locations for individual or group drives.

Each D-W inclosure consists of a specially designed deep-fin corrugated copper cover in two sections, either of which is easily removable. The end walls and the base plate are of sheet steel. At the commutator end, a cooling fan is mounted on a patented "adaptor"—which is virtually an extension of the motor's shaft—and the ventilating current is deflected radially to an annular opening surrounding the end of the corrugated inclosure. The adaptor is easily attached to any motor. The base plate excludes dust or moisture from beneath. It moves with the motor on the slide-rails or other base.

The weight of the entire inclosure is negligible in comparison with the difference in weights of equivalent inclosed-frame and open-frame motors. The saving in cost ranges from around 25 per cent for small motors to as much as 100 per cent for large motors. The inclosures are furnished for open-frame motors of from 5 hp. to 100 hp., either a. c. or d. c. They may be installed easily, full instructions being furnished by the maker. Full particulars may be had by writing to the Daun-Walter Co. at the address given above.

Searchlight Attachment for Portable Lighting

A new searchlight attachment, which may be used with any four-cell, 6-volt dry battery of the "hot shot" type, has just been introduced by the Delta Electric Co., Marion, Ind.

The searchlight, which is invaluable for use about the pit, quarry, or plant, is sturdily built to meet the requirements and rough handling this type of light always receives. It is easy to carry, the handle being molded to fit the hand. The switch is located at the rear of the reflector. The reflector is made of special corrosion-resisting nickel-aluminum alloy which

Searchlight for use with 6-volt battery.

retains its brightness. All other metal parts are rustproof, being cadmium plated.

The light will throw a beam several hundred feet, or a good spread of light may be obtained. The reflector head throws in any position, including straight up.

Popularity of Aluminum Truck Bodies Increasing

In an accompanying cut is shown one of the trucks that are operated in Milwaukee, Wis., by the Manegold Stone Co. for local deliveries. By using strong aluminum-alloy structural shapes and sheet for the body in place of steel, the manufacturers of this Sterling trucks were able to reduce the total weight from 15,380 lb. to 13,300 lb. This means an additional ton of stone or gravel each trip, or 12 extra tons hauled per day without exceeding the state highway load limitations or without increasing operating costs.

Another photo shows one of the trucks in use by Graham Bros., Inc., of Long Beach, Cal. The body of this Autocar 2½-ton truck is constructed entirely of aluminum sheet and structural shapes. It weighs but 600 lb. or 1,000 lb. lighter than the steel body

Aluminum-bodied truck used by a Wisconsin stone company.

formerly used. Yankee Bodies, Inc., manufactured these bodies. The sheets and the structural shapes are of materials produced by the Aluminum Co. of America, Pittsburgh, Pa.

Light-weight truck body used in Long Beach, Cal.

Small, Fast Belt Lacer Makes Repairs Quickly

The Clipper Belt Lacer Co., Grand Rapids, Mich., has recently introduced a new speed lacer, the No. 6. This new lacer is of the same type as the Clipper No. 8 speed lacer, only lighter and smaller in size. It will lace all belts from one inch to and including six inches in width in 1½ minutes, with the same efficiency, ease and speed as its larger brother. The No. 6 will prove ideal for plants in which smaller belts predominate.

A three-quarter turn of the crank, and the powerful jaws of this new

Lacer for belts up to 6-in. wide.

lacer force a row of Clipper hooks cleanly and uniformly into a 6-in. belt. Less than 1½ minutes is required to lace both ends of a belt.

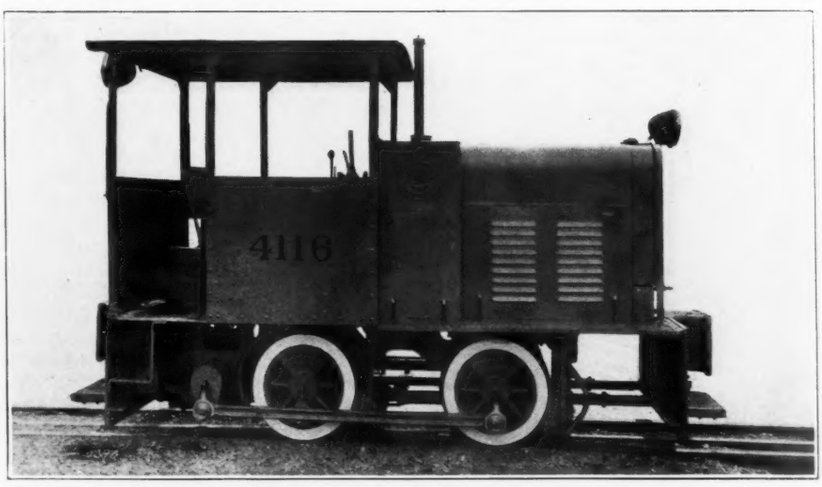
A pressure of 37,500 lb. on the belt is developed by an entirely new principle, embedding the hooks in perfect alignment absolutely flush with the surface, thus prolonging the life of the lacing and reducing the wear on the hooks and pulleys to a minimum. It will lace even the smallest belt with increased efficiency and economy, according to the manufacturer.

New Locomotive Employs a 48-hp. Diesel Engine

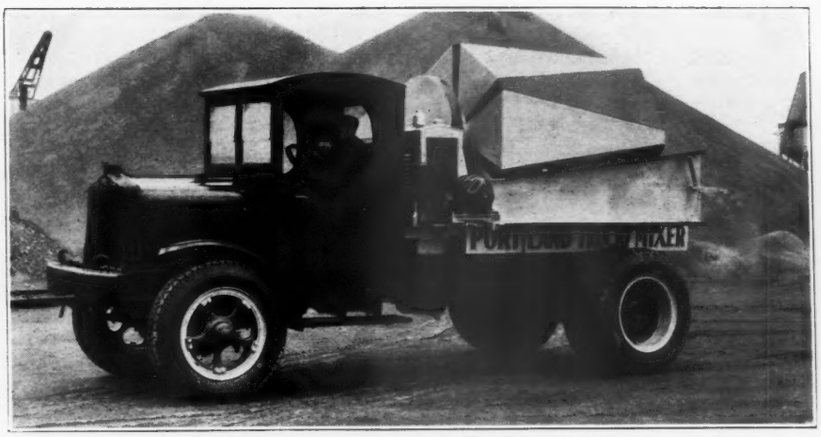
As an evidence of the use and demand for locomotives designed and equipped for burning low-grade fuel oils, the Vulcan Iron Works of Wilkes-Barre, Pa., has recently produced a small Diesel-equipped locomotive weighing 6 tons. It operates on 24-in. gauge Decauville track, having 25-lb. rails, 3-per cent grades and sharp curves.

The locomotive is powered with a Cummins Diesel engine having a 48-hp. rating at 1,200 r.p.m. governed speed. Engine equipment includes Cuno oil filter, Leece-Neville starting-and-lighting system, Borg & Beck clutch, tubular-type radiator with guard, etc. Its constant-mesh jaw-clutch type 4-speed transmission is geared from 2.3 m.p.h. in low to 12 m.p.h. in high speed, with the same range of speeds in reverse. The locomotive develops a starting tractive power of 3,000 lb. The unit has a fool-proof and highly efficient worm-gear driving and reversing arrangement. Traction is secured to front wheels through crank pins and side rods. The driving wheels are 20-in. diameter with rolled-steel tires shrunk on cast-iron centers. Axles are of special alloy steel with cast boxes fitted with brass bearings having oil cellars. Main frames are exceptionally strong O. H. cast-steel double-bar section made in the Vulcan steel foundry, and tied at ends with rolled-steel bumper plates to which are fitted cast coupler pockets. A 3-point spring suspension of the chassis is employed.

The cab is of the canopy type as required in hot climates, and a neatly finished steel hood protects the engine and other interior details. An efficient sanding system controlled from cab is furnished. An easily operated and powerful hand-type brake is provided which is capable of slipping the wheels with very little effort. The brake shoes are of the removable type making for quick and inexpensive replacements. This design of locomotive can readily be built by the Vulcan Iron Works in larger or more powerful units to meet heavier haulage requirements.



New 48-hp. Diesel-driven locomotive.



New type carrier for transporting concrete.

Hexagonal Drum Employed in New Concrete Carrier

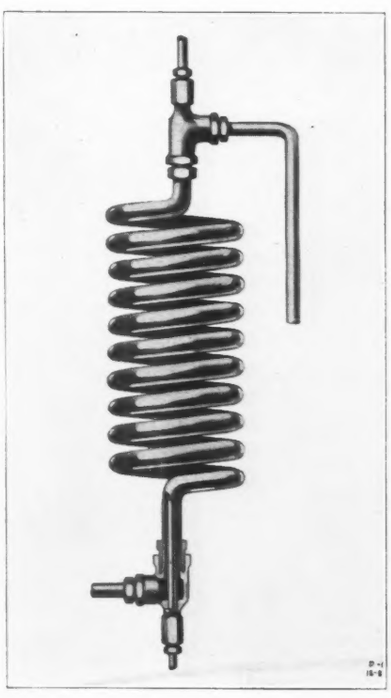
An interesting carrier for the transportation of concrete from ready-mix plants has been developed by the Portland Concrete Machines Co. Chicago. The carrier, mounted on a White Model 52, has a capacity of three cu. yd. with an underbody hoist for discharging the concrete after it has been agitated by a revolving drum driven from a separate motor mounted on the sub-frame ahead of the drum.

This carrier differs from other concrete carriers of the drum type in that the drum is hexagonal instead of cylindrical. The advantage claimed for hexagonal type is that, due to the action of the concrete within the drum, better mixture is maintained. It is also claimed that it can be used as a mixer as well as for a concrete carrier. When used for mixing in transit a 125-gallon water tank can be furnished to be mounted at the forward end of the drum.

The drum is free from internal fins and vanes so there is nothing to become clogged with concrete. Driving the drum by an independent motor eliminates overload on the truck motor and insures uniform, constant rotation of the drum without regard to the speed of the truck or the gears in which it is operating.

Coil Obtains Accurate Sample of Boiler Water

The sampling of steam and water at various points in the power cycle has come to be a vital necessity in modern power-plant operation. Samples are taken:



Cooling coil for testing boiler water.

1. To determine quality of water supply.

2. To control the method of treatment for the prevention of corrosion and scale formation.

3. To control boiler concentration.

4. To minimize wet steam, foaming and priming.

5. To detect and measure condenser leakage.

In order to secure truly representative samples, it is necessary to provide adequate cooling of the hot sample to room temperature while still under pressure. If this is not done, a non-representative sample will be obtained due to the "flashing" of the water samples drawn off. A neat, compact and highly-efficient method of securing representative test-water samples is now offered by Bailey Meter Co. of Cleveland in the Dieform test-water cooling coil.

These coils, which consist of a tube within a tube, as shown in the illustration, are made from copper tubing and Dieform compression fittings. In operation the hot test sample enters the smaller inner tube at the top while the cooling water enters the outer tube at the side outlet on the bottom. Cooling water completely surrounds the inner tube as it passes upward through the annular space between the tubes to the side outlet at the top. This type of test-water cooling coil performs at maximum efficiency because of the counter-flow principle which tends to equalize the rate of heat transfer throughout the entire length of the coil. It also has an added advantage due to the upward flow of cooling water in that a supply of cooling water always surrounds the inner coil regardless of how slowly water flows through the outer coil.

These coils are being used to secure boiler-water samples, steam-manifold samples, evaporator samples, turbine samples and water samples at boiler-feed pumps, feed-water storage tanks and purifiers.

Traveling Gantry Crane With Luffing Boom Handles Sulphur

SULPHUR comes to East Tampa, Fla., by steamer, where the U. S. Phosphoric Products Corp. unloads and stores it. To unload and pile the sulphur, and to transfer it from storage or vessel to cars, requires material-handling equipment of no mean proportions. To handle the sulphur most economically and to clear the vessels and cars quickly, a traveling gantry crane was recently installed on the dock.

This crane spans eighty feet of trackage and storage space. Its luffing boom, when horizontal for unloading of vessels, has an effective reach over the water of 44 ft. The sulphur is removed from the steamers by a bucket of 3-cu. yd. capacity of the Blaw-Knox dreadnaught type. The loaded bucket is lifted at a speed of 150 ft. per min., the holding-line and closing-line hoists being driven independently by two 80-hp. motors. A maximum lift of the bucket of 34 ft. above the dock floor affords a large storage capacity under the crane.

The luffing boom of this crane is raised into almost a vertical position to clear the ships while docking. The boom can be raised at the rate of 5 ft. per min. Each tension member between the top of the "A" frame and the end of the boom has a flexible joint which allows these members to fold when the boom is being lifted. A 30-hp. motor drives two hoisting drums, installed near the top of the "A" frame, which raise the boom by wire cables attached to each boom girder. When raised, the boom is latched in position by engaging fingers. The latch is released by a foot pedal on the upper platform of the "A" frame.

This crane is controlled from an operator's cab which is attached to the crane trolley. Thus the operator travels horizontally with the bucket, permitting accurate handling of the bucket at the speeds available. Five motors are required to operate the various motions of the crane.

Luffing boom raised to permit ships and barges to clear.

This gantry crane has a rated capacity of 7½ tons. Its overall height is 77 ft. and its overall length with boom in horizontal position is 150 ft. An idea of the size of this crane may be obtained from the fact that The Cleveland Crane & Engineering Co., Wickliffe, O., designers and builders, required fourteen cars to ship it. In erecting the crane all riveted field connections were afterward also arc-welded to insure permanent alignment and impart additional strength and rigidity to the structure.

The 7½-ton gantry crane handling sulphur at dock.

Remove Restrictions on Bagging-Machine Users

A consent decree has been entered in the case of the United States vs. Bates Valve Bag Corp. and the St. Regis Paper Co., under the Clayton and Sherman anti-trust acts, by the U. S. District Court at Wilmington, Del.

The suit charged that the defendants required users of bag-filling machinery leased from them to confine their purchase of bags to those manufactured by the defendants or to suffer the right to use the machines.

A perpetual injunction against the enforcement of the restriction on bag purchasers as to source from which they may supply their needs for bags was entered. Filling-machine users are also given the right to fill bags with the machines obtained from the Bates company regardless of the source of the bags.

Manufacturers' Publications

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Concrete

Rex Concrete Factories. 40 p. Illustrated. (Catalogue No. 205. Chain Belt Co., Milwaukee, Wis.) One of the most complete books of its kind published, describing and illustrating three types of concrete plants—wet, dry and shrinkage, with emphasis on the application of remixers, mixers and agitators, respectively, to each of the three types. Engineering data on elevators and belt conveyors also included.

Control Equipment

Bristol's Air-Operated Control Equipment. (Catalogue 400. The Bristol Co., Waterbury, Conn.) Published in three editions, (1) accessories, (2) valve, and (3) instrument sections, the catalogue describes and illustrates the use and application of air-operated control for stack temperatures, steam-pressure regulators and draft and damper control for power plants.

Cranes

The Loadmaster Swing Crane. 12 p., 17 ill. (Frederick H. Poor, Inc., New York, N. Y.) Describes and illustrates a small, self-propelled swing crane for handling loads in areas where operating space is limited.

Drag-Lines

"A Profitable Change from Dredge to Drag-line." 2 p., 6 ill. (*The P & H Crowd* for March-April, 1931. Harnischfeger Corp., Milwaukee, Wis.) Describes and illustrates the change-over from dredge to drag-line excavation at the plant of the Burr Oak Washed Sand & Gravel Co., Burr Oak, Ind.

Engine Accessories

Splitdorf Magneto Model B. 20 p. 7 ill. (Bulletin N-700. Splitdorf Electrical Co., Newark, N. J.) Describes and illustrates a magneto for use on motor-truck and heavy-duty industrial gasoline engines.

Excavators

Bucyrus-Erie 43-B. 22 p. Illustrated. (Bulletin FBE-431. Bucyrus-Erie Co., South Milwaukee, Wis.) Describes a new 1½-1¾-cu. yd. machine recently announced by this company. Available as either shovel, drag-line, clam-shell or lifting crane. Gasoline, electric or Diesel power optional.

Bay City Models R and S. 20 p. Illustrated. (Catalogue RS-4. Bay City Shovels, Inc., Bay City, Mich.) Describes and illustrates two excavators, one of ¾-cu. yd. capacity—the other 1-cu. yd. The machines are full revolving and convertible from shovel to crane, trench hoe or drag-line. Detail drawings and actual operating views are shown.

Lubrication

"Keeping the Oil in Anti-Friction Bearings." 4 p., 5 ill. (*Black and White* for April, 1931. E. F. Houghton & Co., Philadelphia, Pa.) A valuable article on the proper methods of lubricating ball and roller bearings. Means of feeding the lubricant and the selection of the type of lubricant best suited for varying conditions are described.

Miscellaneous

Zelnicker's Bulletin No. 421. 4 p. (Walter A. Zelnicker Supply Co., St. Louis, Mo.) Lists and describes a number of pieces of used machinery, equipment, rails, pipe, piling and tanks for use in non-metallic mineral quarries.

Motor Trucks

FWD Two-tons Capacity H-6. 6 p., 2 ill. (The Four Wheel Drive Auto Co., Clintonville, Wis.) Describes and illustrates a four-wheel-drive truck with a rated capacity of two tons. Wheelbase on the standard model is 133 in. with 145 or 160 in. optional. Engine is 6-cylinder FWD design with an S. A. E. horsepower rating of 33.7.

Screening

Niagara Roller-Bearing Screens. 42 p. Illustrated. (Niagara Concrete Mixer Co., Buffalo, N. Y.) Describes and illustrates a complete line of vibrating screens made in sizes ranging from 4 ft. by 6 ft. to 6 ft. by 14 ft. Dimension charts, views of typical installations and a list of users in the United States and Canada are included.

Perforated Sheet Metals. 40 p. Illustrated. (Cross Engineering Co., Carbondale, Pa.) Describes and illustrates a complete line of perforated sheet metals, including screens, elevator buckets, conveyor troughs and flights, etc.

New Book Valuable Aid to Aggregate Producers

Undoubtedly the most complete reference book on the excavation and moving of materials with power drag scrapers is Sauerman Bros.' new Catalog No. 14. A copy will be sent to any one who sends in his request either to Sauerman Bros., Inc., Chicago, or to the nearest Sauerman distributor.

This catalog is a book of 72 pages with almost two hundred illustrations of equipment details and of installations showing the great variety of work for which drag scrapers are suited. It is graphic evidence of the great advances that have been made in the technique of scraper operation in recent years.

Scrapers are illustrated in sizes up to 12 cu. yd., by far the largest ever built for excavating work, and in addition to the standard Crescent buckets, scrapers are shown in several special designs for special tasks. An entirely new section on tower machines has been added, also.

Installation photographs are grouped into sections that provide detailed information on each of the general classifications of drag-scraper uses. In the excavation of sand and gravel particular improvement is shown in the information on working large pits by the combination of scrapers and field conveyors; also in methods of loading direct to industrial cars or to trucks. The section on cut-and-fill shows an increase in the number and variety of jobs represented. The section on stripping shows in detail the methods by which a scraper can dispose of soil in ravines, in old pits or in high spoil piles. Mine and quarry installations show an especially notable increase since the former catalog was issued, the jobs including placer operations, handling rock in quarries or open-pit mines, slushing, disposing of mine waste, reclaiming from old dumps, and the like.

A further section on unclassified excavating work includes tasks of the most diverse character: excavating various raw materials, such as clay, marl and peat, and contracting jobs that range all the way from underground excavating work below shoring to stripping the canyon walls at a dam site.

Correspondence

To the Editor:

Our company operates a plant on silica sand, including pulverization, in which the miscellaneous dust problem —not the dust from pulverization, which is handled by a separate system—resulting from the drying of heavy tonnages of sand made the slippage of belts and glazed belts and pulleys a constant annoyance.

We tried all types of belt dressings with varying results. A belt man finally advised plain, old-fashioned, genuine castor oil for both rubber and leather belts. A gallon lasts a month or two, has eliminated 99 per cent of our trouble, keeps paper pulleys on motor drives in good shape, eliminates slipping on steel or cast-iron pulleys, and makes belts and belt fasteners last at least twice as long. Perhaps other plants have trouble from dust. If so, we believe castor oil will help them.

CAPE HENLOPEN SAND CO.
Lewes, Del. A. M. Lupton, *Pres.*

After All, It's the Service Test That Counts

And the Eagle "Swintek" Screen Nozzle Ladder on the dredge of the Cleveland Builders Supply and Brick Co., Cleveland, Ohio, illustrated above, has survived this grueling test.

As Mr. W. F. Guenther, purchasing agent, so aptly puts it: ". . . our Swintek Cutter has been in use for two and one half years, during which time it has seen steady service and has proven quite satisfactory."

Mr. Guenther wrote us this letter more than two years ago—so this "Swintek" now has nearly five years of steady service to its credit.

This Swintek, like hosts of others, is writing its own recommendation—in service.

If washing is a *tough* problem, put your troubles up to us. No doubt the EAGLE Washer can solve them.

There is an Eagle "Swintek" working—steadily—in your neighborhood. See it at work (we'll tell you where) and then let us show how the Eagle "Swintek" Ladder will serve you, too.

See P&Q HAND BOOK *Pages 68, 600*

EAGLE IRON WORKS
129 Holcomb Ave. Des Moines, Iowa

The Merrick Conveyor WEIGHTOMETER!

Will weigh within a guaranteed accuracy of 99% any material passing over a conveyor upon which it is installed, and doing it without additional handling, expensive labor, or loss of time.
Weightometers are ideal for weighing stone, gravel, sand, coal and hundreds of other conveyor-handled products.
When properly installed it does its work faithfully and correctly—requires little attention. Write for full details.

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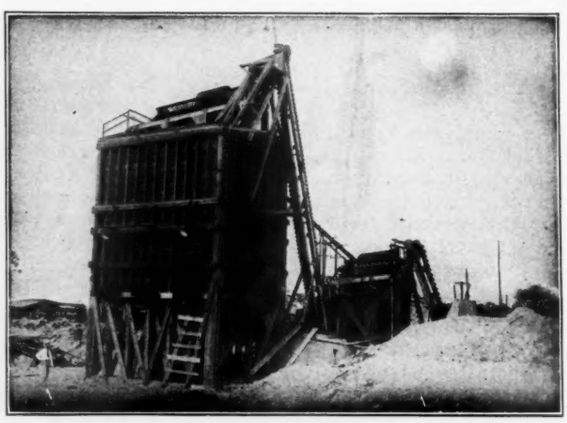
PASSAIC, NEW JERSEY



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BUILT FOR LONG, HARD SERVICE WITH LOW MAINTENANCE COST

We offer RELIANCE Crushing, Screening and Washing equipment in capacities from 50 to 1500 tons per day. Simplicity of design with low operating cost and clean separation.

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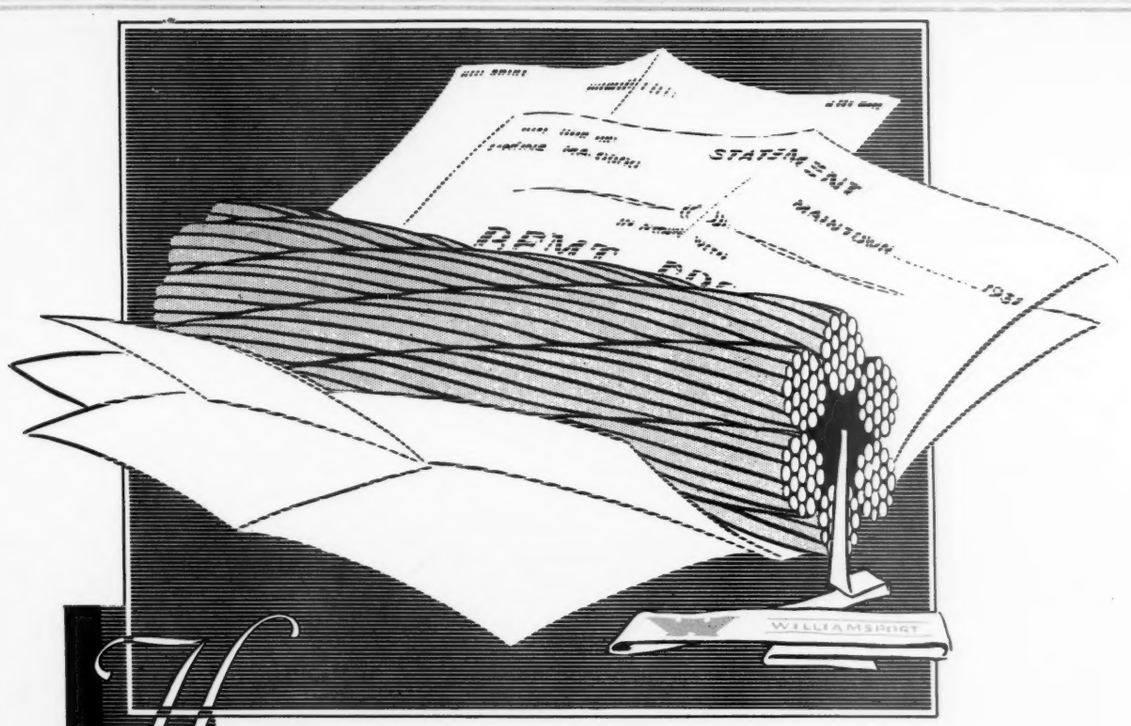
Vol. XXI | MARCH 25, 1931 | No. 13



Hold down your wire rope cost with WILLIAMSPORT cables

You are working in a job that puts wire rope to a supreme test—Why not be particular about your wire rope—Use Williamsport. Every wire is of uniform quality because of our process of manufacture.

Send for our new data book and catalogue—just out.

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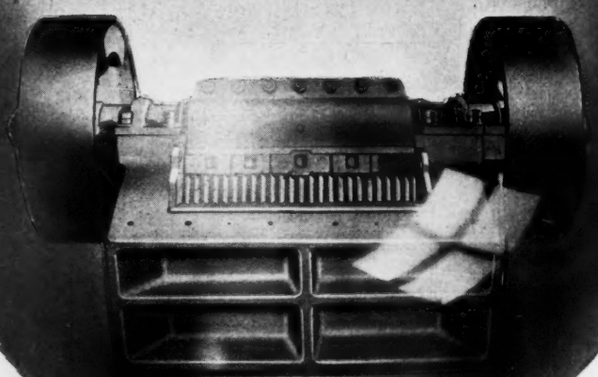
SINCE SEPT. 11, 1929, LARGEST NET PAID CIRCULATION IN THE FIELD
(See A. B. C. Audit Reports for Details)

THEY HAVE STOOD THE ACID TEST OF TIME



HOUR AFTER HOUR,
DAY AFTER DAY,
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A CEDAR RAPIDS CRUSHER
WILL GIVE YOU BETTER
SERVICE AND MORE UNIFORM
PRODUCTION THAN ANY OTHER
TYPE OF CRUSHER. THE QUALITY
OF THE MATERIALS USED, THE
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When It is Crusher Time with You—BUY Cedar Rapids.
"Performance is what Counts"

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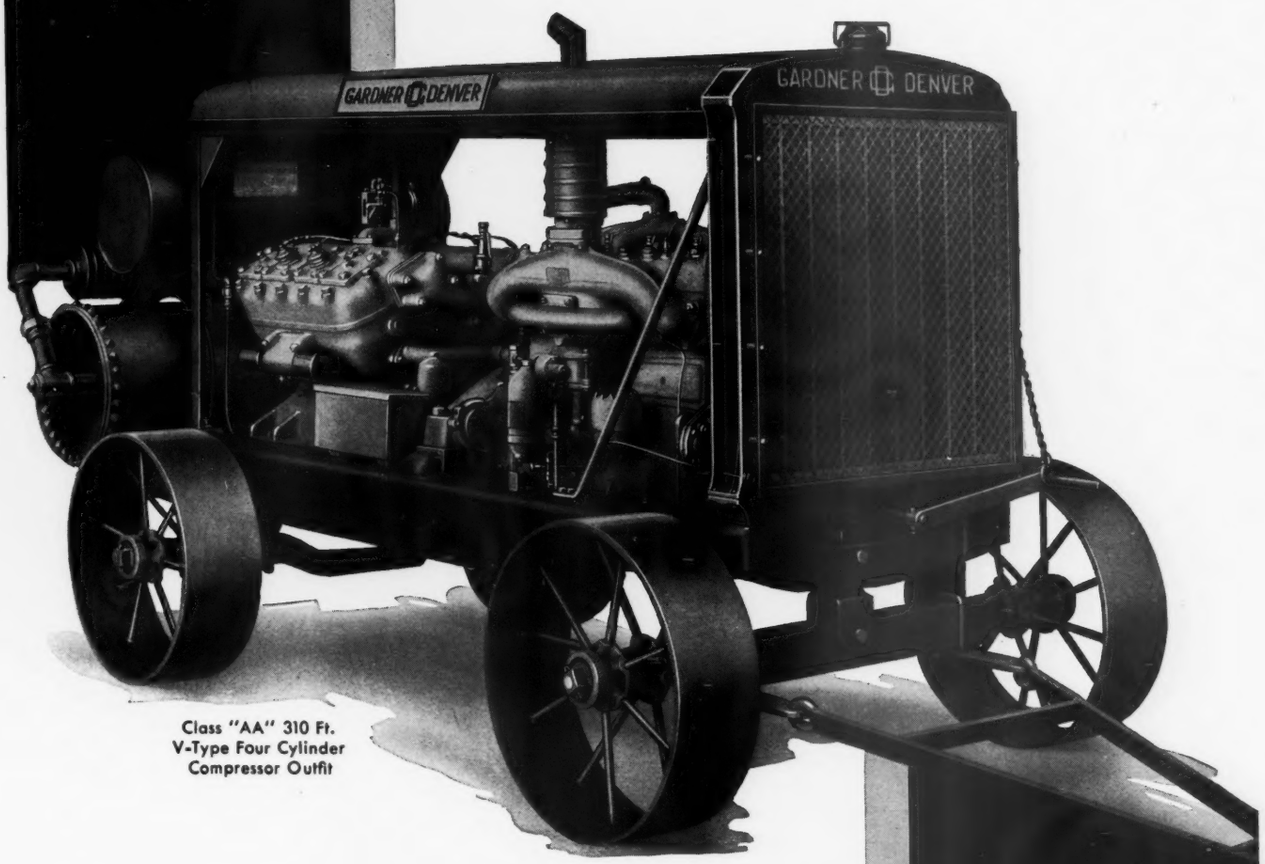
Iowa Manufacturing Company

Cedar Rapids, Iowa

FULLY BALANCED
SMOOTH RUNNING

PORTABLE COMPRESSOR



Class "AA" 310 Ft.
V-Type Four Cylinder
Compressor Outfit

For CONSTRUCTION— QUARRYING and MINING

Force Feed Lubrication
with Filtered Oil

IMPROVED DESIGN

LOW FUEL AND UP-KEEP COSTS

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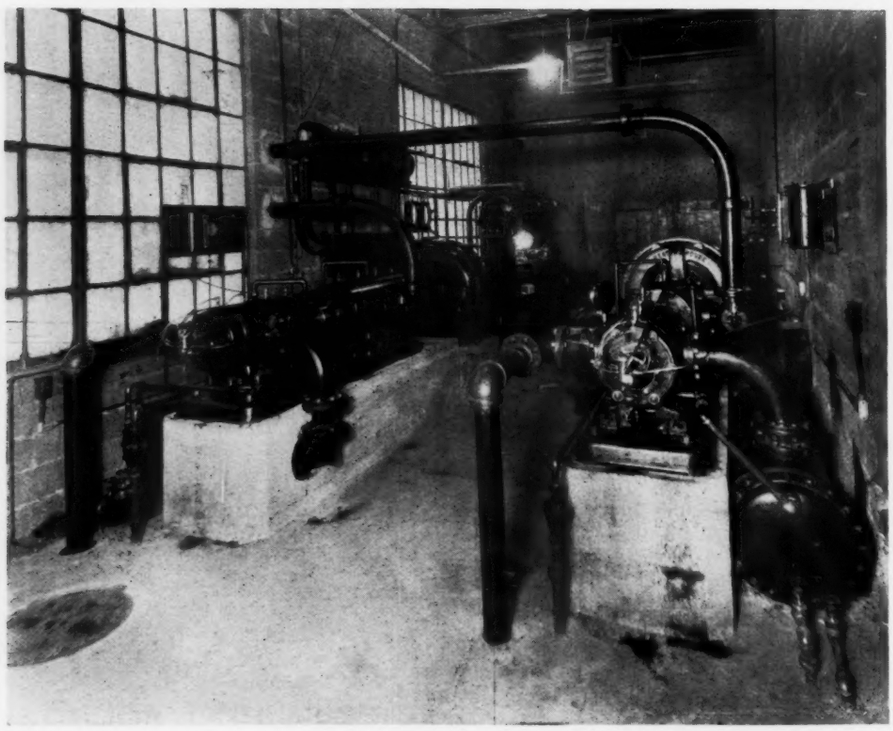
FULLER ROTARY AIR COMPRESSORS



An Actual Delivery of 750 c.f.m. at 100 Lbs. from Each of These Small Two-Stage Compressors

Compact design with two-stage efficiency and straight line coupling to the driving motors are well illustrated in the cement mill installation shown above.

The well known advantage of rotary motion permits large compressed air deliveries with units of remarkably small size.

The photograph was taken during normal operation, during which the compressors were loaded and unloaded repeatedly. The complete absence of vibration is indicated by the clarity of detail.

FULLER ROTARY AIR COMPRESSORS and VACUUM PUMPS are available in a full range of capacities for operating pressures up to 170 pounds gauge. Single-stage units are similar to one stage of the machines illustrated above, and are likewise driven at motor and internal combustion engine speeds.

Single and two-stage vacuum pumps are furnished for vacuua up to 29½″ (referred to 30″ barometer).

OTHER PRODUCTS

FULLER-KINYON CONVEYING SYSTEMS—for dry, pulverized materials
FULLER-KINYON PORTABLE PUMPS—for unloading bulk cement
THE AIRVEYOR—a pneumatic system, especially applicable for unloading fine, crushed and granular materials from cars and boats.

Fuller Company

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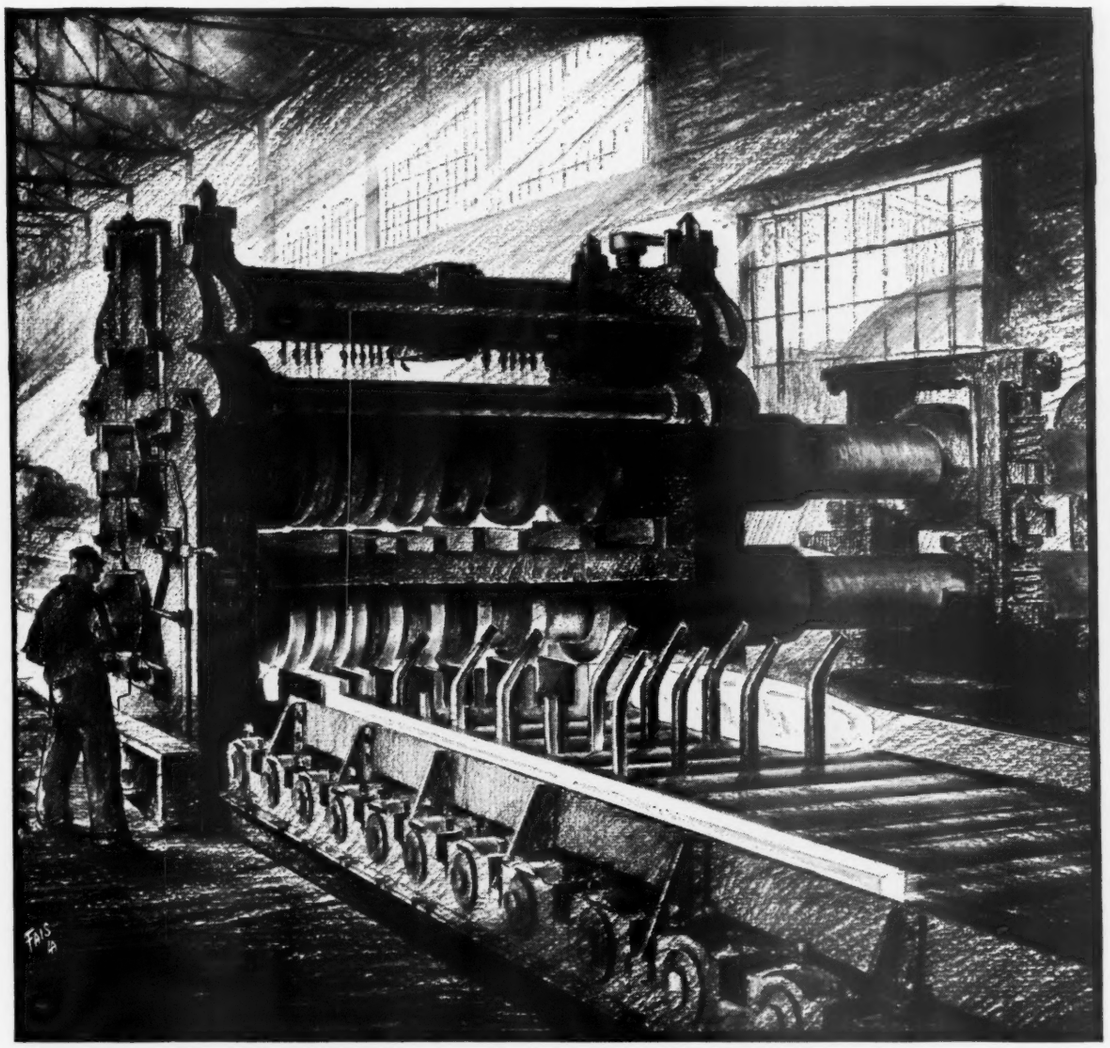

Hungry jaws *knead* the glowing ingot

FIERY red, an ingot of steel glides up the rollway. Then cruel jaws seize the glowing mass and mold it...back and forth ...like so much incandescent putty. Fourteen inches wide, sixteen inches deep and five feet long, when it enters this mill...it leaves a slender "bloom," four inches by four and seventy feet long.

Follow a "bloom" of Roebling acid open-hearth steel and you will understand the exceptional safety and stamina of Roebling "Blue Center" Steel Wire Rope. As it passes through a seemingly endless chain of processes, each step of production is marked by painstaking thoroughness. The technique of every operation is the result of over 90 years of experience.

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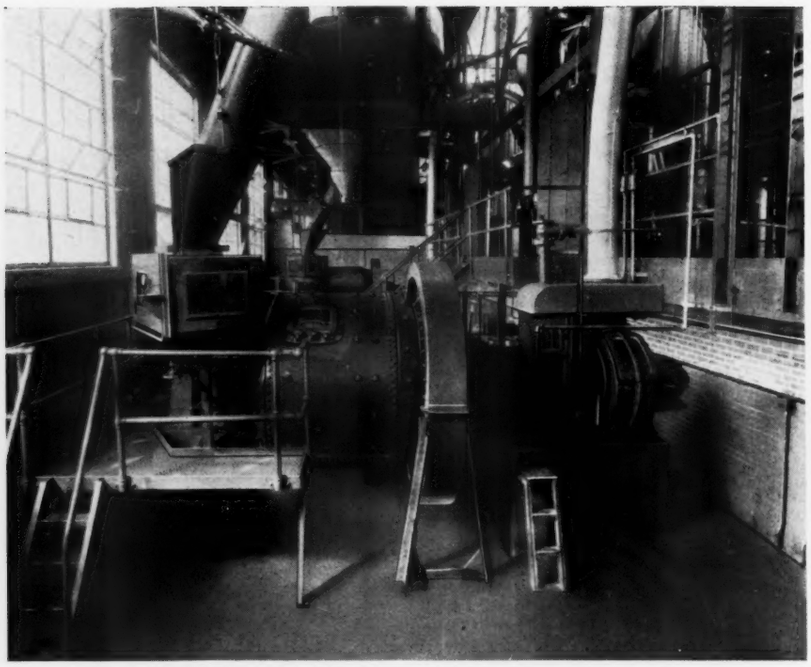
ROEBLING "BLUE CENTER" STEEL **WIRE ROPE**



The Hardinge Unit Coal Pulverizer

for

Firing Cement Kilns

The illustration shows 2 Hardinge Unit Coal Pulverizers, equipped with Constant Weight Feeders of the enclosed type, grinding and delivering pulverized coal to furnaces for steam generation. The same general arrangement is also applicable for firing cement kilns.

The Hardinge Unit has been developed to combine the low operation cost of the slow speed Conical Ball Mill with a system of control that will permit the delivery of fuel to the kiln to be varied instantaneously over the entire range of kiln requirements.

A single adjustment automatically controls the three vital points in the system—raw feed to the mill, delivery of fuel to the burner, and air velocity in the unit.

Write for information

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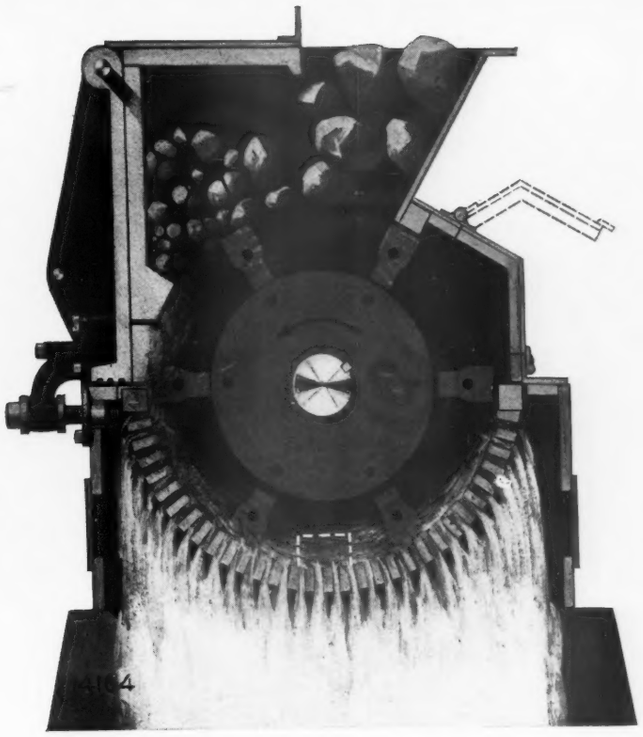
Conical Ball, Pebble and Rod Mills, Ruggles-Coles Dryers, Feeders, Thickeners, Rotary Screens, Tubular Conveyors, Sanitation Equipment

Greater Capacity

More Uniform Product

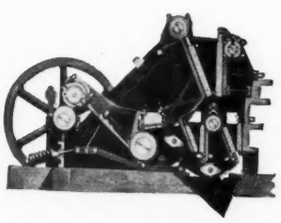


with Less Power Consumption

unique method of operation in the Jeffrey Type B Pulverizer is not used in any other machine because it is protected fully by patents. *The material is held in suspension above the rotor* until reduced to substantially the desired product.

The results are (1) minimum power consumption, (2) more efficient operation from the standpoint of maintenance, and (3) a high uniformity of product. Clogging over the screen bars is eliminated.

The patented method of operation also makes possible a balanced distribution of metal—wearing parts are not burdened with surplus dead weight, hence lower maintenance costs are characteristic of this machine.



Jeffrey-Bakstad 3-Jaw Crusher

Performs both primary and secondary crushing in one machine. Will reduce 6 to 12 inch rock to ½ inch in one operation. It will produce the same amount of a 1 inch product as an ordinary crusher will of a 2 inch product. Write for Catalog No. 3-A.

For heavy, continuous duty specify a Jeffrey Type B Pulverizer—capacities up to 500 tons per hour—steam shovel size material reduced to 1½" and under in a single operation.

Catalog No. 450-D gives sizes, capacities and construction details. May we send you a copy now?

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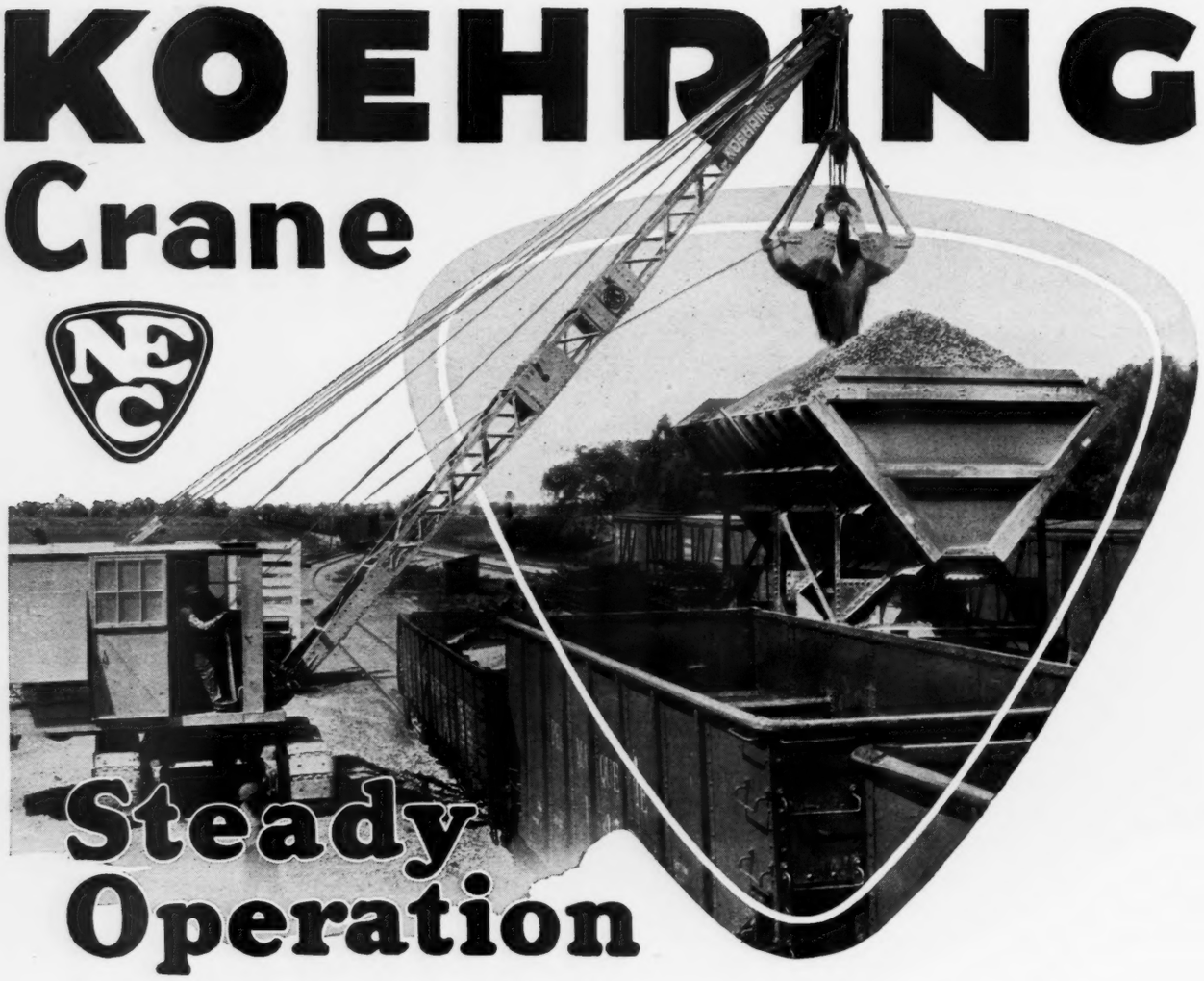
- Portable Loaders
- Coal and Ashes Handling Equipment
- Skip Hoists
- Crushers—Pulverizers
- Sand and Gravel Handling, Washing and Screening Equipment
- Locomotives
- Mine Equipment
- Ventilation Fans

KOEHRING Crane



Steady Operation

A constant flow of power — with a reserve for the peak load requirements— at the greatest speed that keeps the work within easy control of the operator, makes for greater yardage at lower unit cost.

It isn't the spurt of speed that wins. It's the long, steady, continuous pull at a high, constant speed and freedom from interruptions and delays. Heavy Duty construction, ample power, ease of control, — these are the qualities that give the Koehring continuous uniform high-speed performance.

And behind it all is Koehring accessibility . . . simplicity . . . and Koehring *Heavy Duty* construction.

To *know* the Koehring is to discover that there is wide-margin superiority of value among cranes. Why not write for catalog?

Koehring Crane Capacities

Quickly convertible to shovel, pull shovel or dragline.

No. 301—11 tons at 12′ radius. 1 yd. clamshell bucket at 28′ radius, 40′ boom. Other sizes at proportionate radii and boom lengths.

No. 401—15 tons at 12′ radius. 1 yd. clamshell bucket at 34′ radius, 45′ boom. Other sizes at proportionate radii and boom lengths.

No. 501—19 tons at 12′ radius. 1¼ yd. clamshell bucket at 36′ radius, 45′ boom. Other sizes at proportionate radii and boom lengths.

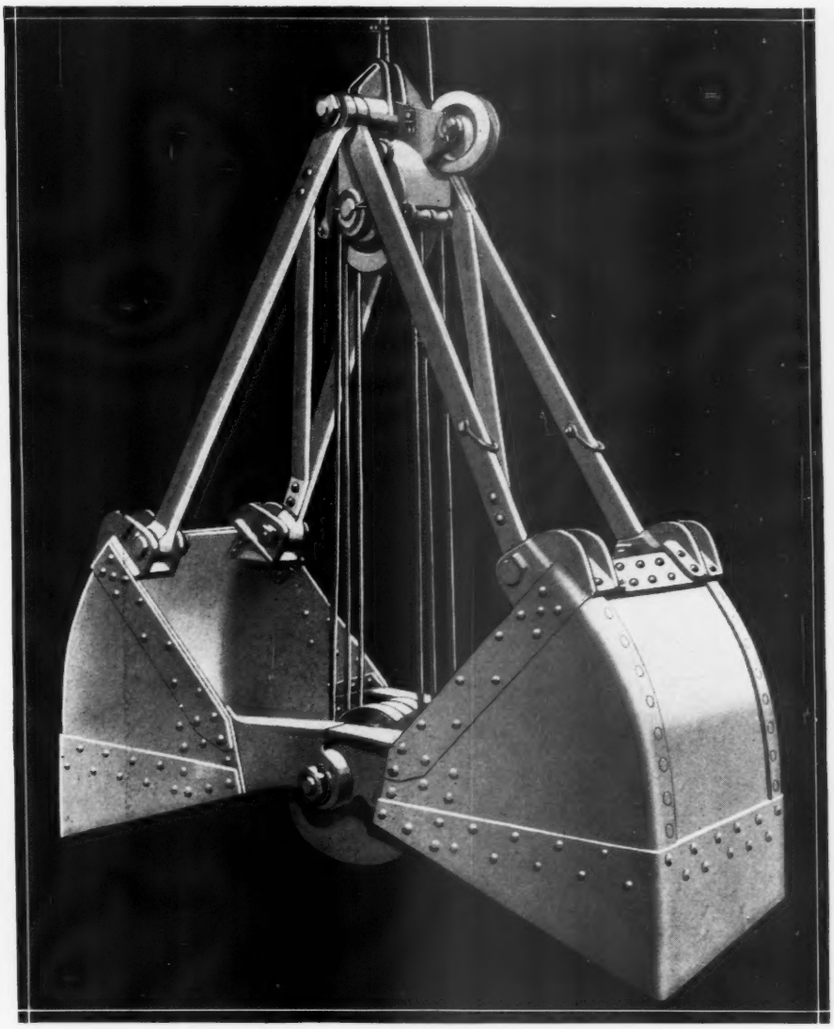
No. 601—21 tons at 12′ radius. 1½ yd. clamshell bucket at 34′ radius, 45′ boom. Other sizes at proportionate radii and boom lengths.

National Equipment Corporation

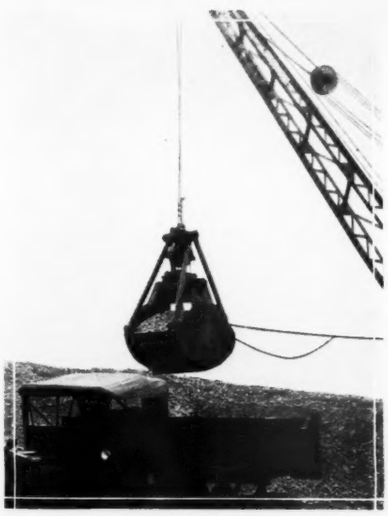
N. 30th St. & W. Concordia Ave., *Milwaukee*

A6200-I

These Buckets Have to be Good



ASK the old-timer who has run them all and he will tell you that an Industrial Brownhoist will "bury" most cranes on fast bucket work. Ask him why and you will find that one of the reasons is the better bucket with which these cranes are equipped —the Industrial Brownhoist Clamshell.



Industrial Brownhoist's interest in getting the best buckets for its cranes goes far deeper than any individual owner's. That is why we have built buckets for more than a quarter century and why we build them to such high standards of dependability.

You can't get big output with a mediocre bucket, no matter how good your crane. But you can improve any crane's performance by reeving on a better bucket. That applies just as much to the crane you own as it does to the ones we build.

Why not speed up your crane's output by putting on a bucket which you know is right? Industrial Brownhoist Clamshells cost no more and are built in all standard sizes and for rehandling or heavy-duty service.

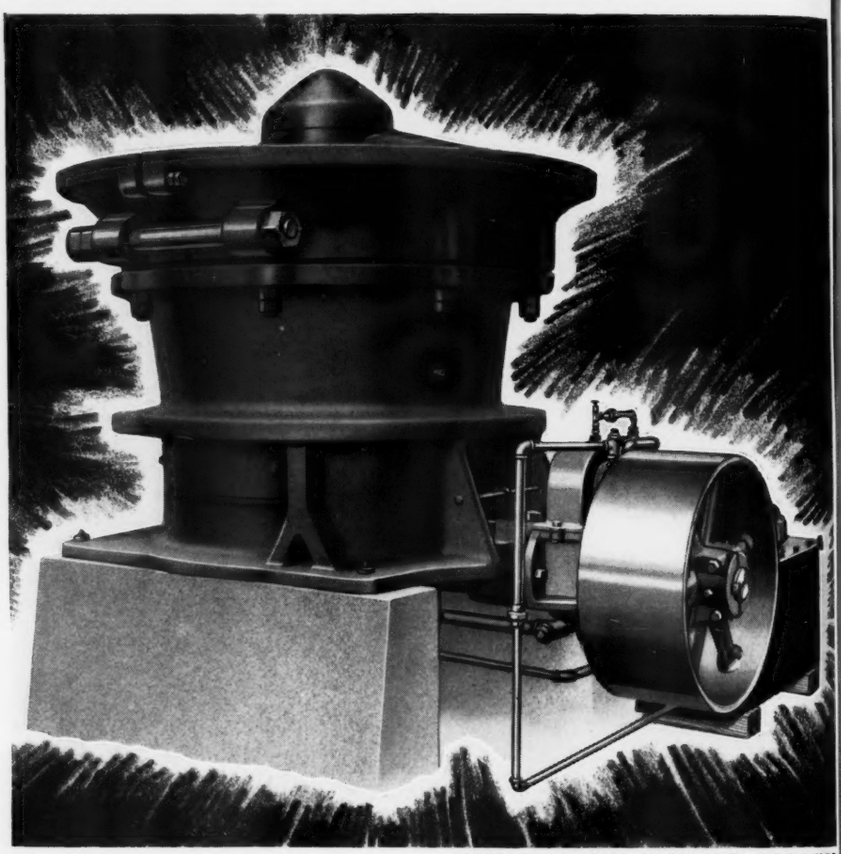
Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division. Elyria, Ohio.

INDUSTRIAL BROWNHOIST

NEW TELSMITH



NEW TELSMITH PRIMARY BREAKER

Higher Speed... Greater Capacity

Never has Telsmith superiority been more strikingly apparent than in the new Telsmith Crushers. Outstanding in every detail of design, performance and value . . . they were created to augment that security against breakage and costly shut-downs which the miner, quarry man and gravel plant operator demands more insistently today than ever before.

WRITE TODAY FOR DETAILS

Sound engineering and practical research . . . with the background of Telsmith's twenty-five years of crusher specialization . . . have produced these new crushers, built as all other long-lived Telsmiths have been built—for efficient, effortless, continuous service, in heavy duty.

Extra output has always distinguished Telsmith. Important improvements and refinements, incorporated in the new Telsmith Crushers, increase crusher speed and capacity even further . . . add to the life of the machine . . . reduce maintenance cost.

CRUSHERS

• WITH THESE CONSTRUCTION ADVANCEMENTS

the New Telsmith Primary Breaker and the New Telsmith Reduction Crusher are, in still greater degree, the outstanding values in the hard rock crushing field:

1 The main drive gears are steel *with cut teeth.* 2 Faster crushing speed and greater capacity. 3 The countershaft is of alloy steel, turned and polished . . . equipped with sight feed lubrication and *tapered roller bearings.* No outboard bearing required. 4 Self-priming, internal-gear oil pump . . . mounted on top of countershaft box for easy accessibility. 5 Oil pump is driven by cut spur gears completely housed and running in oil. 6 Large oil storage tank equipped with oil gauge, strainer to remove coarse dirt, baffle plates to settle fine grit, removable cover for ready inspection of return oil flow, and bottom drain plug. 7 New Telsmith Reduction Crusher has two-section, self-tightening, manganese steel mantle.

• In addition to these new value features, the new crushers retain all the fundamental quality advantages of previous Telsmiths, including: short, compact structure . . . force-feed lubrication . . . removable babbitt sleeves . . . the famous Telsmith *Parallel Pinch,* uniformly effective at all parts of the head, crushing even the biggest and hardest rock without slippage . . . super-strong *steel* frame, *steel* crown, and fixed *unbreakable* shaft . . . and the Telsmith Guarantee of all three vital crusher parts against breakage even by tramp iron—the most remarkable warranty in crusher history.

The new Telsmith Crusher Bulletin is just off the press. It contains valuable information on crushing practice as well as complete information about the New Telsmith Primary Breaker and the New Telsmith Reduction Crusher. Mailed free. Just write and ask for Catalog C-15.

SMITH ENGINEERING WORKS
304 East Capitol Drive :: Milwaukee, Wis.

Canadian Representatives:
Canadian Ingersoll-Rand Co. Ltd., Montreal, P. Q.

11 West 42nd St., New York City	716 Builders Bldg., Chicago, Ill.	Harrison Bldg., Philadelphia, Pa.
1367 East 6th St. Cleveland, Ohio	Borchert-Ingersoll, Inc., St. Paul, Minn.	Knox Eng. & Eq. Co, Indianapolis, Ind.
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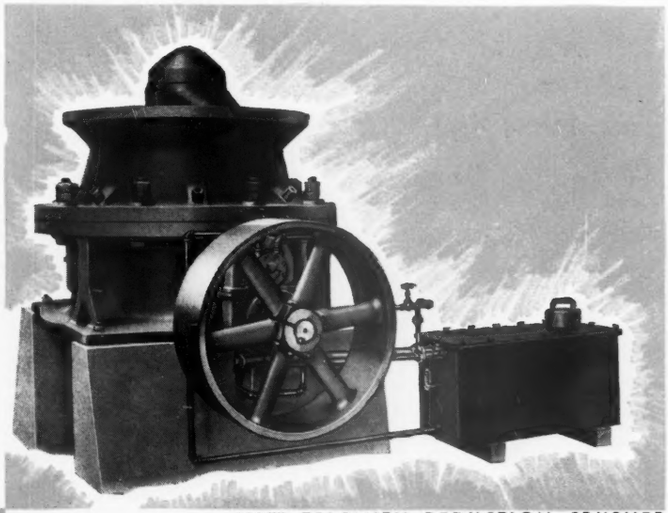
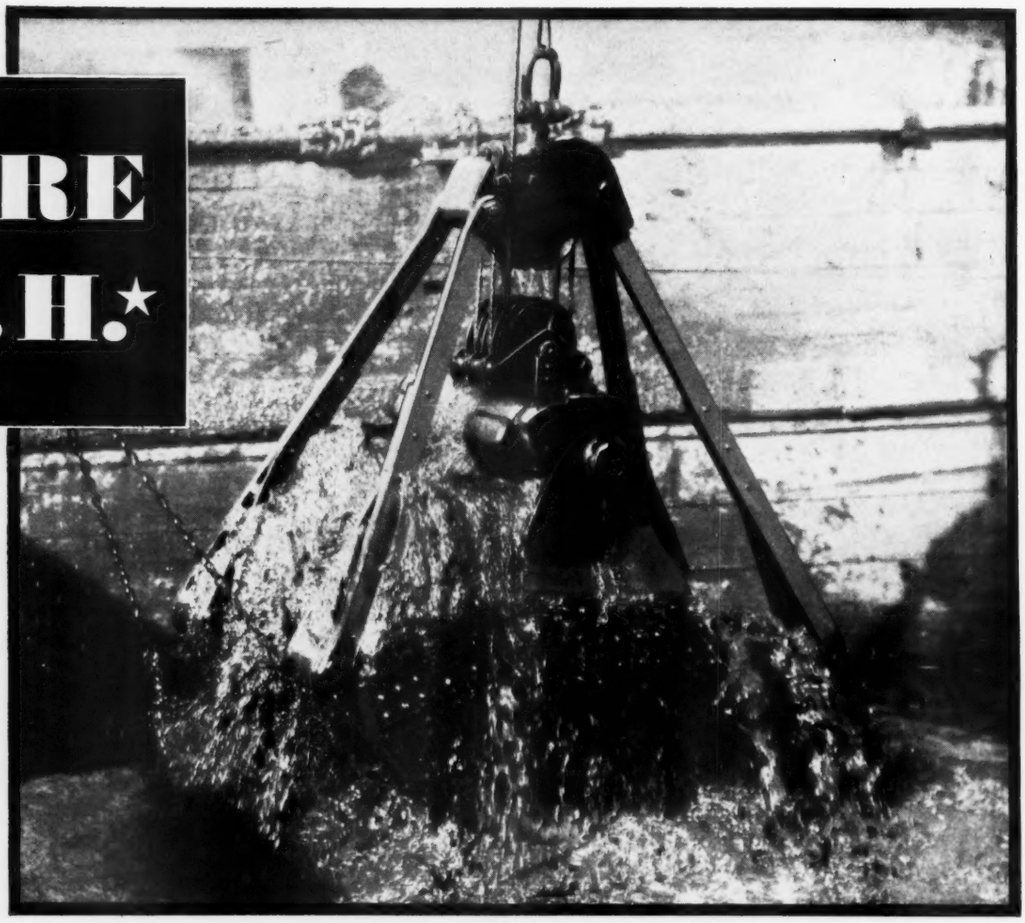


NEW TELSMITH REDUCTION CRUSHER

TELSMITH

BS-21

MORE Y.P.H.★



THAT'S WHAT MAKES AN OWEN A PAYING PRODUCER . . . .

★More Yardage Per Hour in an Owen clamshell bucket—like more miles to the gallon in a good auto—means *lower operating costs.*

More Yardage Per Hour—that's going through the job in the shortest time. Making every trip count. Biting deep, closing in the material, getting full loads every time—often overloads. Fast, clean dumping. Easy, smooth performance.

More Yardage Per Hour links the Owen Guarantee with every Owen Bucket—"A Bigger Day's Work Than Any Other Bucket of the Same Weight and Capacity."

More Yardage Per Hour—that's why every Owen Bucket job is a profitable job.

Write us about the kind of work you have for a clamshell bucket, and we'll send definite data on the Owen that will do it for you with More Yardage Per Hour.

The Owen Bucket Company, 6017 Breakwater Avenue, Cleveland, Ohio

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen Buckets

A MOUTHFUL AT EVERY BITE

SAVES
40% ON FUEL COSTS

The Galesburg Sand & Gravel Company's Buda, Ill., plant where a Blue Streak Gas-Oil Engine saves 40% on fuel, driving a Telsmith Crusher and auxiliary equipment.

AND RETAINS THE FLEXIBILITY, EASY STARTING AND DEPENDABILITY OF GASOLINE POWER

Blue Streak Gas-Oil Engines eliminate the obstacles to the economies of fuel oil power. They retain all the advantages of gasoline and permit you to enjoy these advantages at a distinct saving in first cost and in still lower operating costs not heretofore available.

The experience of the Galesburg Sand & Gravel Company, at their Buda, Ill., plant, is typical of Blue Streak performance. The eleven-hour-day's consumption of Stanolind Furnace Oil costs $3.07 (will cost only $2.01 with larger storage facilities) instead of $5.08 formerly paid for a day's supply of gasoline.

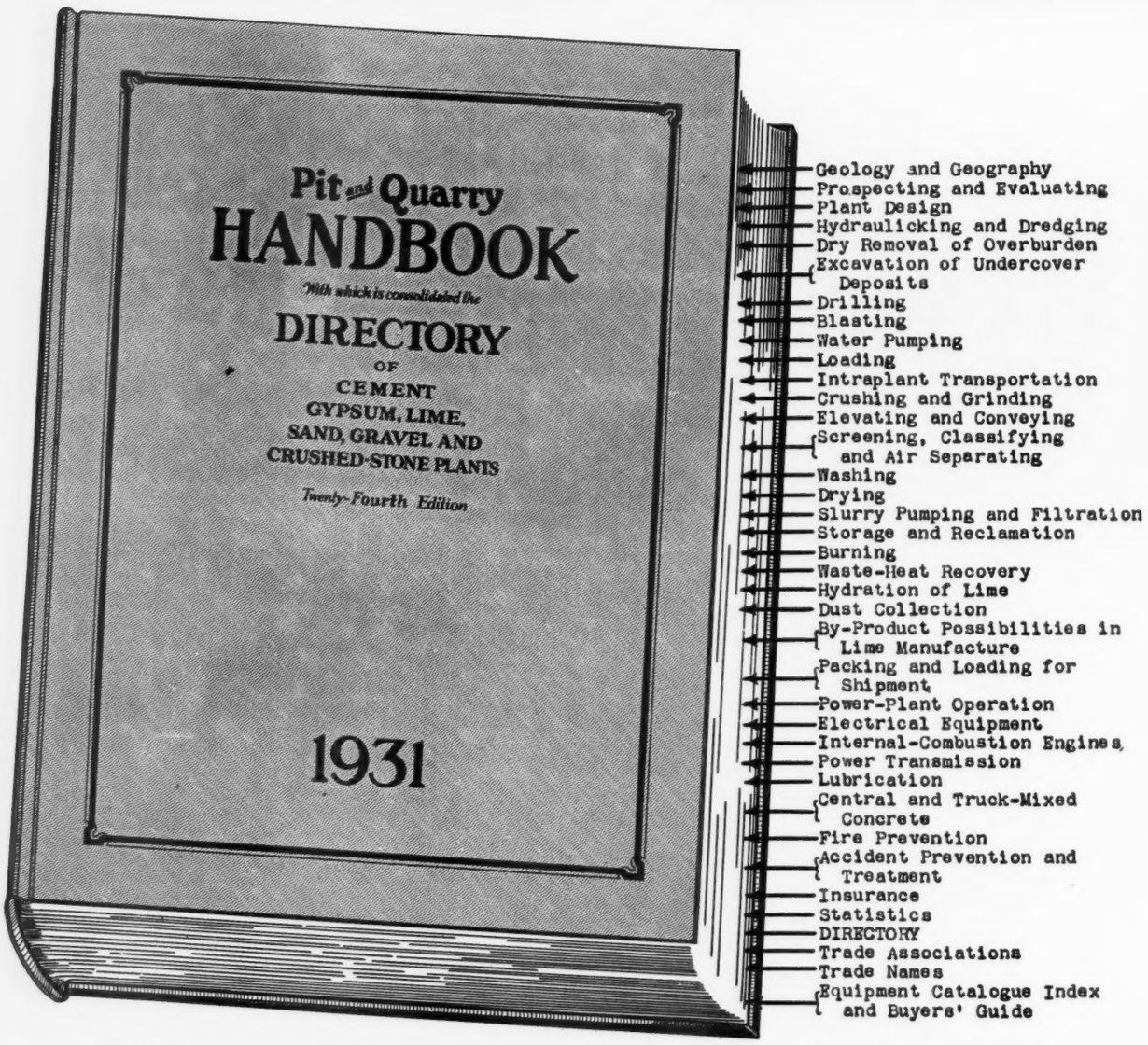
The Blue Streak starts easily when cold, on gasoline . . . runs on gasoline for 5 or 10 minutes . . . switches to fuel oil while running. It is economical of lubricating oil, water, repairs and service. It requires no skilled operator. It responds to the throttle with the speed and flexibility of the best gasoline motor. In fact it is a gasoline motor equipped with Blue Streak Gas-Oil Combustion to secure the savings of fuel oil. As Mr. Edward Castell, engineer of the Galesburg Sand & Gravel Company's plant, says, the Blue Streak "equals an electric motor . . . runs perfectly eleven hours a day . . . does the work with fuel oil better than an engine of equal power does on gasoline."

You, too, can secure the economies of fuel oil power and retain the advantages of gasoline. Start by writing for literature describing Climax Blue Streak Gas-Oil Engines from 30 h.p. to 180 h.p. Climax Engineering Company, 72 West 18th Avenue, Clinton, Iowa.

GASOLINE ADVANTAGES AT FUEL OIL COST

Blue Streak GAS-OIL ENGINES

A-5900



Here It Is, at a Glance—Brand New!

The illustration above shows, graphically, the contents of the 1931 edition of Pit and Quarry HANDBOOK and Directory, just off the press. The only book of its kind. Every section has been brought right up to the minute. The Directory is the largest and most complete listing of producers ever compiled—and every item is *verified*.

If you have not already purchased your copy of this indispensable book, order now, before the limited printing is exhausted.

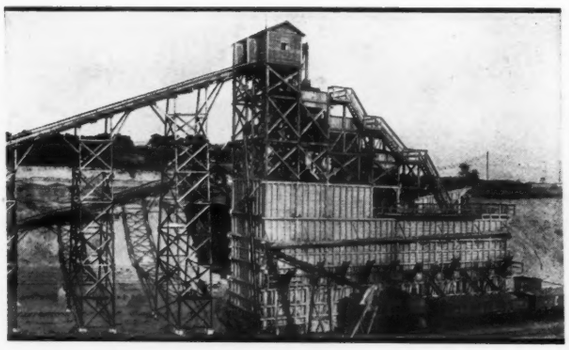
Pit and Quarry Handbook and Directory, 1931 edition.....	**$5.00**	Clubbed with a 1-year subscription to Pit and Quarry.....	**$6.00**
Pit and Quarry Handbook and Directory, 3 consecutive editions...	**$12.00**	Clubbed with a 3-year subscription to Pit and Quarry.....	**$15.00**

The above rates for North and South America, and U. S. Possessions. Elsewhere, add $1.00 per year per publication.

Pit and Quarry Publications

538 S. Clark St., Chicago, Ill.

PIT AND QUARRY HANDBOOK PIT AND QUARRY PIT AND QUARRY DIRECTORY



Getting out tonnage

It is not enough to have considered the digging, the thorough washing and the accurate sizing of the product, for to get out the tonnage is the daily problem. The crew must function in a well organized manner, cars must be available, but most vital is the necessity to have properly coordinated machinery equipment.

Feeders, elevators, conveyors and screens must operate with that smooth unfailing regularity that will daily insure a full day's run at plant capacity.

Equip your plant now

Now there is one sure way to have a dependable plant of this kind. Have S-A Engineers design and build your new installation or permit them to make a survey of your present equipment. They may suggest modifications that will improve your arrangement.

The market may demand some new sizes this season or there is the chance that you can gather and mix some of your different products. Surplus storage with quick reclaiming features may mean new profits for you. There is no obligation in this connection.

If you have not already seen the new catalog No. 33 describing the latest types of machinery equipment for producing sand and gravel send for your copy immediately.

Write to Stephens-Adamson Mfg. Co. Plants at Aurora, Illinois — Los Angeles, California — Belleville, Ontario. Canada.

STEPHENS ADAMSON

No High Installation Costs When You *Build Your Own* Sand and Gravel Plant

FACT 1

One Man Outfit

One man can operate a Novo Dragline Hoist excavating as high as 600 cu. yds. of aggregate per day. On this particular job, the operator works the friction levers on the hoist by means of two lines.

FACT 2

Digs—Strips—Stores

With a Novo Dragline Hoist, you can dig from all parts of the pit—up hill or down or from under water—over any distance up to 400 ft. Using a dragline outfit is also the most economical method for stripping overburden.

FACT 3

Permanent or Portable

Novo draglines are mounted on heavy timbers or on wide-faced steel wheel trucks. Skid mounted draglines are sometimes mounted on automobile trucks or trailers for fast, easy portability.

THE average dragline set-up is so simple to install that hundreds of contractors are doing the work themselves at a big saving in costs. All that's needed is a Novo Dragline Hoist, one or two scrapers and a sufficient length of cable.

The Novo Hoisting Handbook gives you all technical data required, plus photographs and drawings of typical installations.

The first step is to write for that Handbook and see what others are doing to lower their aggregate handling and stripping costs. It's an "On The Job" reference book that you'll want to keep—and there is no cost or obligation attached.

NOVO ENGINE COMPANY
CLARENCE E. BEMENT, Vice-President and Gen. Mgr.
262 Porter Street Lansing, Michigan

NOVO
PUMPS · ENGINES · HOISTS
NOVO

FACT 4

Screening and Loading

By using a short ramp, the aggregates can be discharged directly onto a grizzly screen, placed over the loading bin—or the dragline can be used to feed the material to a conveyor system.

FACT 5

Several Sizes

Novo Dragline Hoists are built in sizes ranging from ⅓ to 1 cu. yd. capacity. Powered with Novo Timken Roller Bearing equipped gasoline engines or electric motors.

FACT 6

Send for That Handbook

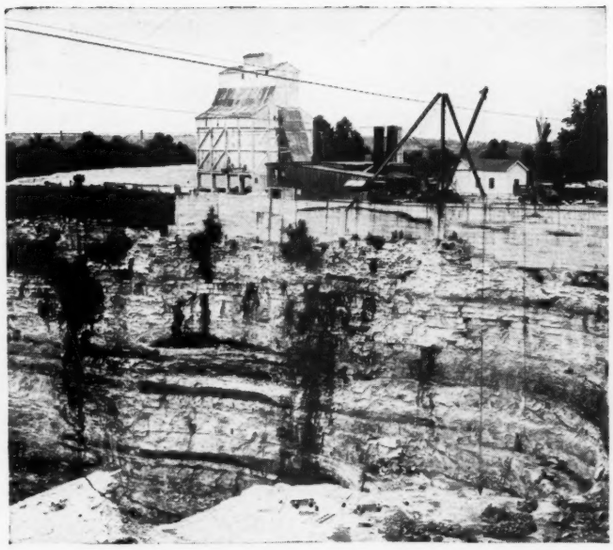
Fill in and mail the coupon today. Your investment—one minute and a 2c stamp.

NOVO ENGINE COMPANY,
262 Porter St., Lansing, Mich.
Please send me Dragline Hoist data and the Novo Hoisting Handbook.

Name.....

Address.....

City..... State.....

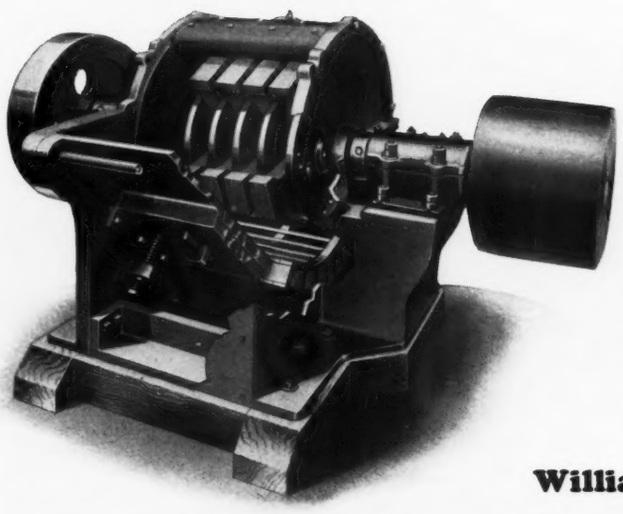


Frank Ruprect Quarries, St. Louis, has operated a Williams Hammer Crusher almost continuously for three years. Has frequently delivered 50% more capacity than guaranteed.

St. Louis City Workhouse. Their Williams Crusher was sold to crush 30 tons per hour. Often averages 69 tons per hour during a working period.

—now ELEVEN

Eleven Quarries in St. Louis District now operating Williams Hammer Crushers



The "Jumbo Jr." type Crusher. Reduces "one man" stone to 1¼", ¾" or agstone depending upon adjustment.

O. E. Wegener is the latest quarryman in the St. Louis district to purchase a Williams Hammer Crusher, making eleven in that locality alone. Such general acceptance is typical of Williams Hammer Crushers wherever installed, whether in Missouri, Texas, Indiana or Kansas. First they deliver more crushed rock, dollar for dollar invested, than any other crusher. They also handle larger rock, deliver a better product with no slabs or slivers and are adjustable to make the small sizes, ½" to 1¼", now so much in demand. The Jumbo Jr. type illustrated reduces hand loaded rock to 1¼", ¾" or agstone in one reduction, larger sizes crush steam shovel loaded rock to 1¼" and smaller. 30 sizes, capacities 10 to 300 tons per hour.

Williams Patent Crusher & Pulverizer Co.

802 St. Louis Ave., St. Louis, Mo.

Chicago
37 W. Van Buren St.

New York
15 Park Row

San Francisco
337 Rialto Bldg.

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS, MO. U.S.A. TRADE MARK

REG U.S. PAT OFF

Williams

OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

WILLIAMS

PATENT CRUSHERS GRINDERS SHREDDERS

The Fertilizer
GREEN BOOK

Keeps You in Touch with Markets in the Fertilizer Field

The Fertilizer GREEN BOOK, published monthly, is a progressive and helpful news and editorial service offered to all producers and mixers of fertilizer and fertilizer materials.

If you produce any of these materials:

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you should read the Fertilizer GREEN BOOK regularly. It is the one practical method of keeping in touch with this great field and its markets.

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Complete Service Publishing Co.
538 S. Clark Street **Chicago, Ill.**

More holes to the blast.. Fewer misfires!

A number of the features from the No. 5 G. M. machine have been incorporated in the du Pont No. 2 and No. 3 Blasting Machines. These machines are now being manufactured with a two-point clutch, an eight-point breaker switch and a condenser. These improved machines materially reduce the chances of misfires in thirty- and fifty-hole shots.

with these new *and* improved BLASTING MACHINES

Developed by General Motors for du Pont, these new blasting machines are now offered to save you money in blasting operations!

The NEW du Pont No. 5 Blasting Machine . . . known as the No. 5 G. M.—because it was designed by General Motors . . . has proved highly successful in many blasting operations where it is necessary to fire a large number of holes at one time.

Here are the special new features that will recommend No. 5 G. M. to you:

(1) A two-point clutch which makes it possible to send the current out on the firing line at its peak.
(2) A laminated armature and solid core field for building up the maximum current.
(3) A one microfarad condenser to store up the current until the moment of discharge.
(4) Most important of all, a new eight-point breaker of unique design which utilizes the current heretofore wasted as a large spark at the completion of the stroke.

Field windings on the new machine are so placed as to increase its efficiency. There are ball bearings on the armature shaft; and a thrust bearing for the rack bar in the direct line of the thrust instead of offset as formerly.

The new machine has a rated capacity of 100 electric blasting caps. As a matter of fact, it has often fired as many as 125 holes connected in series. The weight of this machine is a little less than 36 pounds.

In quarry and construction work, No. 5 G. M. has proved particularly useful. Its large volume of current at sufficient voltage reduces the chances of misfires from electric leakage.

E. I. DU PONT DE NEMOURS & CO., INC.
Explosives Department
WILMINGTON, DELAWARE

DU PONT
REG. U. S. PAT. OFF.

✓ check these features

Check the following three features of Thor Cochise Rock Drills with the machines you are now using. Compare and see why Thor Cochise Drills are superior

1—LOW AIR CONSUMPTION

2—FAST DRILLING SPEED

3—LOW MAINTENANCE COST

2 Fast Drilling Speed

Thor COCHISE ROCK DRILLS

The Thor Cochise Model 40 is a remarkable rock drill. It has proven to be the fastest drilling machine of its size on the market. In test after test, under all conditions, it has outperformed every other drill of the same capacity.

Modern quarry operations demand speed in drilling together with low air consumption and low maintenance costs. Because of the greater footage and lower costs made possible by Thor Cochise Drills they hold the premier position in many of our greatest mines and quarries.

The best way to prove these facts to your own satisfaction is to test a Model 40 under your own conditions. Its easy action, drilling speed and air economy will surprise you.

Send for Bulletin 27 which shows Thor Cochise Rock Drills and Stopers. A copy should be in your files

COCHISE ROCK DRILL DIVISION

INDEPENDENT PNEUMATIC TOOL CO.

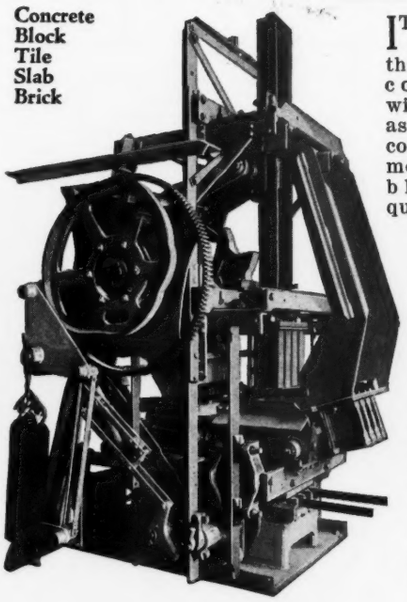
New York ‹‹‹‹‹‹‹ TOOLMAKERS SINCE 1893 ›››››››› *London*

PNEUMATIC TOOLS ‹‹‹ ELECTRIC *Thor* TOOLS ››› AIR COMPRESSORS

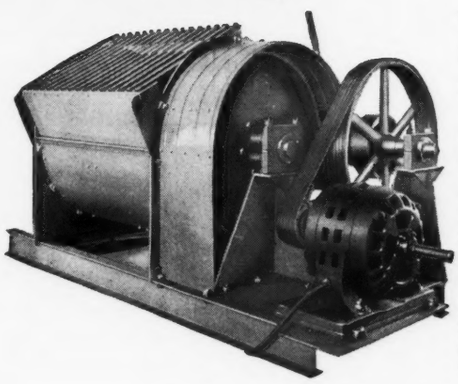
612 W. Jackson Blvd. **Chicago, Illinois**

NEVER SO EASY SO PROFITABLE

Concrete
Block
Tile
Slab
Brick



IT has never been possible to start in the manufacture of concrete products with so little outlay as now. The first cost of Besser equipment is low. Besser block machines require only one set of pallets for any size or type of block, slab, tile and brick. This is a big saving in first cost and in operation. Besser Stripper machines are 100% automatic. This means lower labor cost and no skilled operators necessary. Besser machines are substantial and durable, few moving parts and exceedingly low operating cost and upkeep. Ask for your copy of New Illustrated Catalog of Besser Strippers.



BESSER
Batch Mixers

Made in 5, 12, 18, 25, 30, 40 and 50 cu. ft. capacities. Besser Mixers are in use in leading plants throughout the country and are preferred because of speed, thorough mixing, long life, easy charging and discharging, low power requirements and low first cost.

The Seven Divisions of BESSER SERVICE to The Concrete Products Industry

1. BESSER SUPER STRIPPER. 7 blocks, 14 slabs or tile or 42 concrete bricks per minute.
   BESSER STANDARD STRIPPER. 6 blocks, 12 slabs or tile or 36 concrete bricks per minute.
   BESSER VICTORY STRIPPER. 4 blocks, 8 slabs or tile or 24 concrete bricks per minute.
   These Stripper Machines make the block on plain pallets and only one set of pallets required for a very large variety of product.
2. BESSER MASTER TAMPER. FACE DOWN MACHINE. 3 to 4 blocks per minute.
3. BESSER BATCH PADDLE MIXERS in Seven Sizes. 5, 12, 18, 25, 30, 40 and 50 cu. ft. capacities.
4. AUTOMATIC CONCRETE BRICK MACHINE. 40 to 50 M per day.
   MASTER CONCRETE BRICK MACHINE. 10 to 20 M per day.
5. BESSER SEWER, CULVERT AND DRAIN TILE MOLD. All sizes up to 5 ft.
6. CARS, PALLETS, ELEVATORS, ETC.
7. BESSER FACILITIES FOR SERVICE AND ENGINEERING ASSISTANCE.

Free Engineering Service

Besser Engineers will design and lay out plants with equipment for any capacity production desired—small or large—and will set up machines and start them in successful operation. Estimates on plant equipment gladly furnished. Write or wire.

BESSER MANUFACTURING CO.
Main Office and Factory
503 31st STREET, ALPENA, MICHIGAN
District Sales Offices at
Philadelphia — Newark — Dayton — Chicago — Milwaukee
Omaha — Detroit — Pittsburgh — Indianapolis

"We have paid *four times* your price . . .

. . . and did not get half as good quality!"

These are the words of a prominent excavator who has been using Gatke Moulded Asbestos swinging frictions and brake linings for years.

"We take great pleasure in informing you that Gatke Moulded is far superior to any product we have ever used. We give our opinion from actual experience. *Gatke goods can't be duplicated."*

Gatke Moulded Brake and Friction Blocks are the *standard* material for most of the original equipment makers. Drop a note for information on your particular job—save time—save money. Write—

GATKE CORPORATION
Manufacturer
228 N. LaSalle Street CHICAGO

GATKE
MOULDED
BRAKE AND FRICTION BLOCKS

WHEN BETTER AIR SEPARATORS ARE BUILT, GAYCO BUILDS THEM

MODELS "TWENTY-SEVEN" and "TWENTY-EIGHT"
GAYCO CENTRIFUGAL SEPARATORS

REPRESENTS ANOTHER GAYCO ADVANCE IN AIR SEPARATOR PRACTICE

The GAYCO PATENTED method of sizing by CENTRIFUGAL FORCE has been perfected and the mechanical construction improved, giving greater capacity, cleaner tailing and higher efficiency than is possible with any other Air Separator.

Quick, Positive Adjustments for hundreds of different meshes.
Perfect, Automatic Lubrication without any oil waste.
Steep Angle Cones which prevent material from building up and choking.

NO DAMPERS — NO CHOKE DEFLECTORS — NO OIL-CUPS — NO GREASE-CUPS

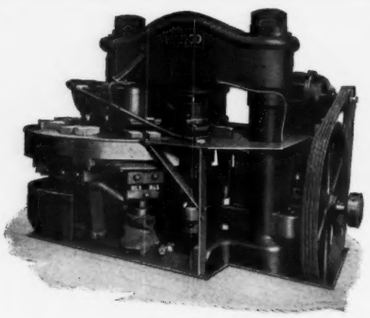
RUBERT M. GAY COMPANY, INC., 114 Liberty St., New York, N.Y.

THE ONLY LOW VELOCITY AIR SEPARATOR WHICH SIZES BY CENTRIFUGAL FORCE

LOW COST

Upkeep cost so low you could swipe it out of petty cash and never miss it. *Get the facts. Write today!*

UNIVERSAL VIBRATING SCREEN CO.
RACINE ~ ~ WISCONSIN



SILICA Building Brick Machinery

A new catalog on new machines sent on request.

W. A. RIDDELL COMPANY
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JACKSON & CHURCH SAND-LIME-BRICK MACHINERY

Don't throw away your sand screenings or calcium lime! Turn this by-product into money with Jackson & Church Sand-Lime-Brick Machinery. There's demand for sand-lime-brick! Jackson & Church Machinery is designed for efficiency and economy. It produces a maximum output at small cost.

It will pay you to investigate this money-making proposition.

JACKSON & CHURCH COMPANY
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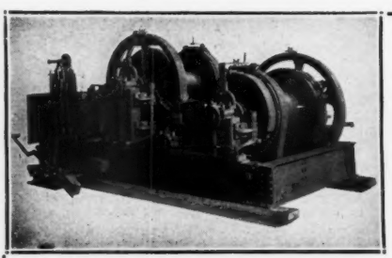

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SLACKLINE HOISTS ARE KNOWN FOR DEPENDABILITY AND EASE OF OPERATION. THEY ARE BUILT WITH JUST AN ADDED TOUCH OF TOMORROW.

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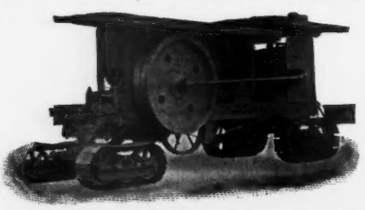
HOIST DERRICKS CABLEWAYS SLACKLINE EXCAVATORS

STREET BROS. MACHINE WORKS
Incorporated
CHATTANOOGA, TENN.

LOOMIS "CLIPPER" BLAST HOLE DRILLS

Steel welded or wooden frame furnished
Manila or Steel Cable

Drill Faster
Cut Labor Costs and Reduce Power Consumption



Superior drilling has been the record of "Clipper" Drills wherever used. That's why there are more "Clippers" in use than any other make. You buy the best when you buy "Clipper" Improved Type Drills.

Built in several sizes and styles for any size blast hole, and in steam, gasoline, compressed air or electric power. Also round wheels.

LOOMIS MACHINE COMPANY
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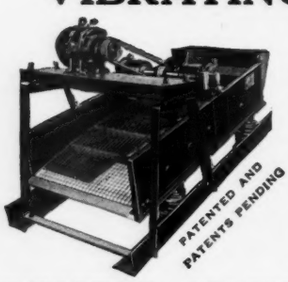
PLAT-O VIBRATING SCREEN



Produces with high efficiency and accuracy larger tonnages per square foot of effective screening area than any other machine of its kind. Differential conveying action of Plat-O Screen permits operation at very flat angle. Controlled action of screen cloth greatly increases capacity output.

All popular sizes, single, double, and triple deck. Send for our New Bulletin.

DEISTER MACHINE COMPANY
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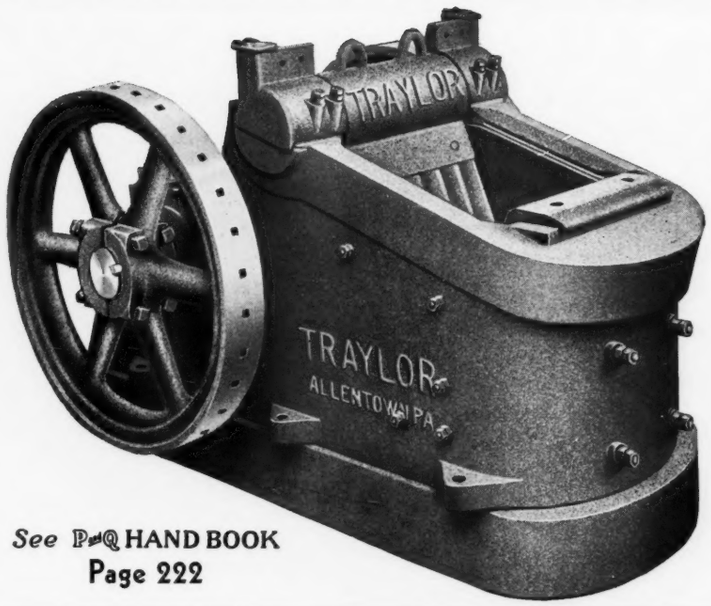

See P&Q HAND BOOK
Page 222

So Hungry!

The Traylor Bulldog Jaw Crusher asks no favors of the rock given it to digest—its "appetite" is voracious and indiscriminate! Its capacity for hard work—and plenty of it, will please any producer, in any business!

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(2) Shaped to conform to circumference of pulley.
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BELT PLATES

Another Feature ~ the Screen Cloth . . .

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are built right for Quarry and Gravel Pit

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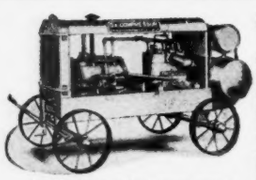

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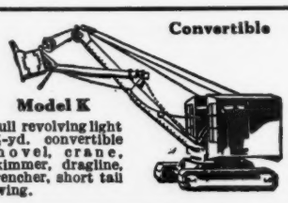

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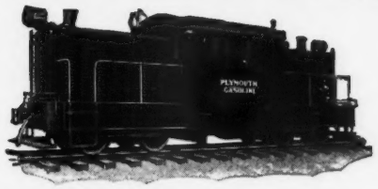

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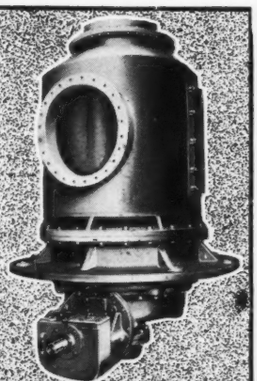

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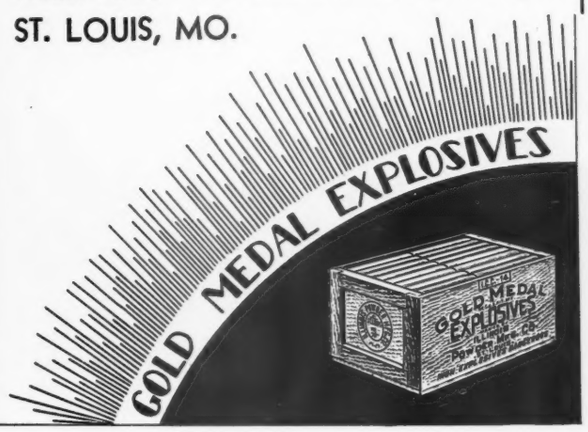

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- ☐ Cars, Kiln
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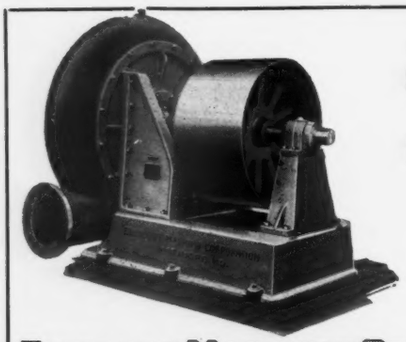

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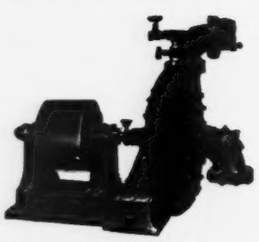

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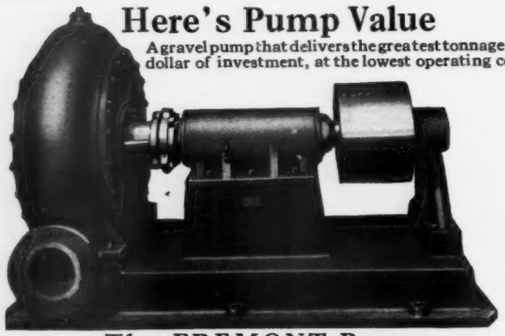

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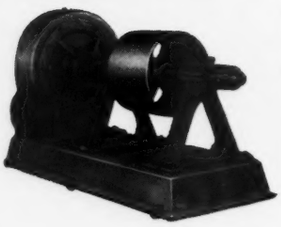

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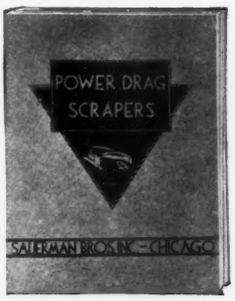

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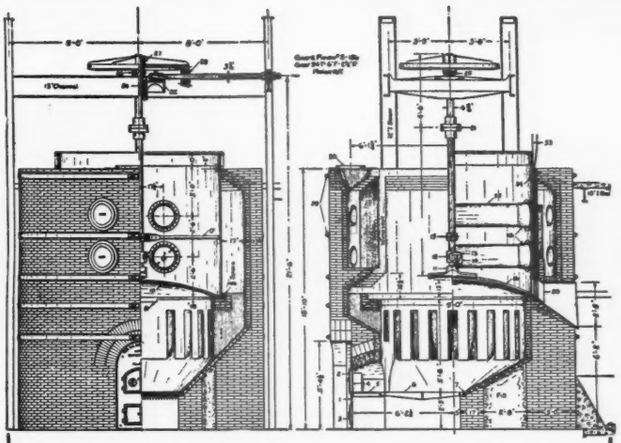

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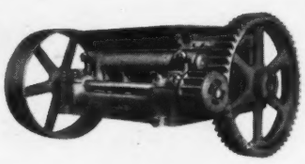

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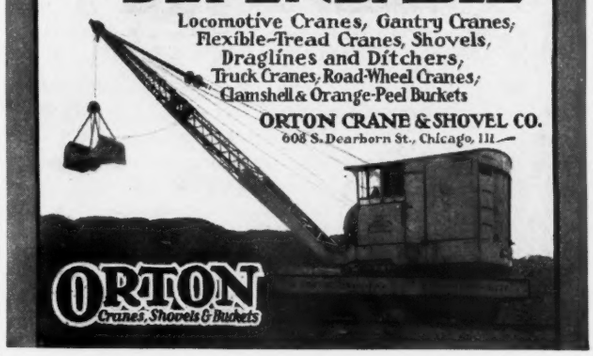

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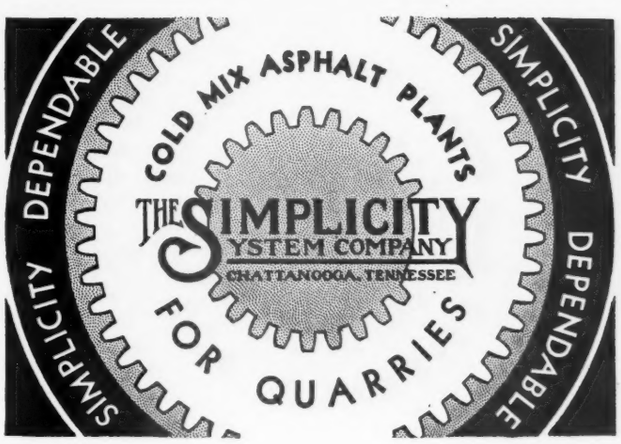
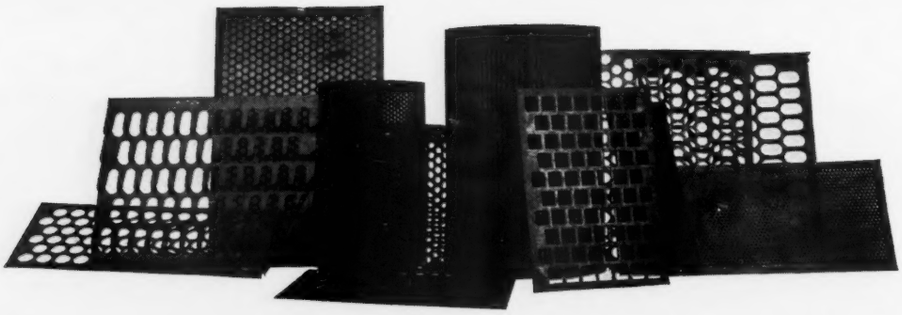
Lewistown Foundry & Machine Co.
Lewistown, Pa.





For Best Results Use the Morrow!

THE Morrow Perforated Metal Screens for sizing and preparing coal, sand, gravel, stone, and other bulk materials are made by a company specializing in screening machinery.

Behind our recommendations to you lies years of experience which has taught us the best line of screens to use for a given work.

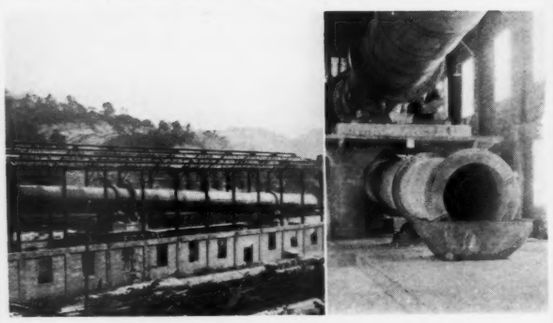
You are offered such sizes and shapes of perforations which we know to be best suited to the screening of bulk materials.

If our wide stock does not suit your particular purpose, we will make special plates to your specifications. Our factory is equipped to roll or flange plates to order, and will punch marginal holes as directed.

Write for full particulars.

THE MORROW MFG. CO. QUALITY MORROW SERVICE WELLSTON - OHIO

COMPLETE EQUIPMENT for LIME PLANTS



ROTARY KILNS—

BLAW-KNOX SERVICE INCLUDES

- Lime Kilns
- Rotary Kilns & Coolers
- Hydrators
- Cooler Separators
- Steel Piping
- Dust Control
- Beater Mills
- Feeders
- Steel Inclines
- Burners and Burner Boxes
- Miscellaneous Patented Specialties
- Tracyfiers (Purifiers for Steam, Gas & Vapors)
- Clamshell Buckets
- Steel Buildings
- Steel Bins
- Steel Grating
- Stairways and Platforms

An experienced personnel, coupled with the facilities of the Blaw-Knox Organization, will design, build and equip lime and hydrate plants; redesign and reconstruct existing plants, or furnish equipment as desired.

Blaw-Knox Engineering Service, complete from design to erection, is available to the Lime Manufacturing Industry.

BLAW-KNOX COMPANY

2080 Farmers Bank Bldg., Pittsburgh, Pa.

New York, Chicago, Philadelphia, Birmingham, Buffalo, Cleveland, Detroit, Baltimore

BLAW-KNOX

PORTABLE CRUSHERS

LARGE OPENING LARGE CAPACITY

Cut costs by using one of these practical and convenient outfits near the job. Very widely used by state, county and township highway boards. A real time and money saver for the road building contractor. Practical for commercial pit and quarry.

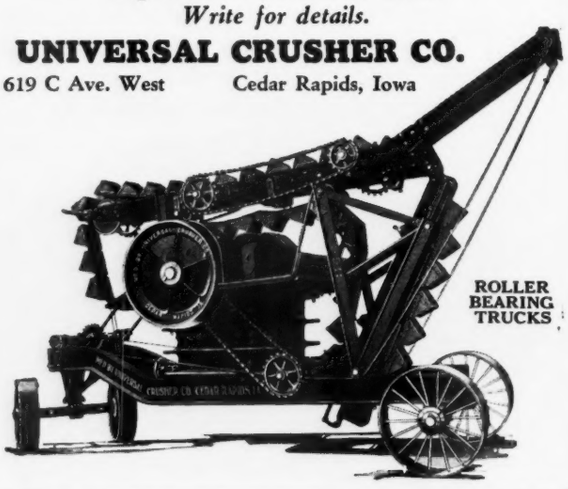
Stone may be crushed to any specification with these strong light weight steel crushers. Furnished with or without screens, bins, conveyors. 26 Sizes to choose from. A crusher fitted to your job.

Capacities to 450 tons 10 hours.

Write for details.

UNIVERSAL CRUSHER CO.

619 C Ave. West Cedar Rapids, Iowa



Classified Buyers' Guide

A Directory of Pit and Quarry Advertisers Arranged According to Product

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.

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Smith Engineering Works
Stephens-Adamson Mfg. Co.

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Fuller Co.
Gifford-Wood Co.
Industrial Brownhoist Corp.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
Lewistown Foundry & Machinery Co.
Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
Smith Engineering Works.
Stephens-Adamson Mfg. Co.
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National Equipment Corp. (Insley Division)
National Equipment Corp. (Koehring Division)
National Equipment Corp. (Parsons Division)
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

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Link-Belt Co.
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Link-Belt Co.
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Novo Engine Co.
Sauerman Bros.
Street Bros. Machine Works

Dragline Excavators
Harnischfeger Corp.
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Link-Belt Co.
National Equipment Corp. (Insley Division)
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Street Bros. Machine Works, Inc.

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Gardner-Denver Co.

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Loomis Machine Co.

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Pennsylvania Drilling Co.

Drills (Blast-Hole)
Gardner-Denver Co.
Independent Pneumatic Tool Co.
Loomis Machine Co.

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Gardner-Denver Co.
Independent Pneumatic Tool Co.

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Dryers
Blaw-Knox Co.
Fuller Lehigh Co.
Hardinge Co. (Ruggles-Coles)
Iowa Mfg. Co.
Lewistown Fdry. & Mach. Co.
McGann Mfg. Co., Inc.
McLanahan and Stone Corp. (Ruggles Coles) Hardinge Co.
Traylor Eng. & Mfg. Co.

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Blaw-Knox Co.

Dust-Collecting Systems
Raymond Bros. Impact Pulveriser Co.

Dust Control
Blaw-Knox Co.

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Fuller Co.

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Engineers
Allen Cone and Machy. Corp.
Blaw-Knox Co.
Burrell Eng. & Const. Co.
Elwood Mfg. Co.
Fuller Co.
Iowa Mfg. Co.
McLanahan and Stone Corp.
Stephens-Adamson Mfg. Co.

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Novo Engine Co.
Street Bros. Machine Works, Inc.

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Climax Engineering Co.
Novo Engine Co.

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Du Pont De Nemours & Co., Inc., E. I.
Illinois Powder Mfg. Co.

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Morrow Mfg. Co.
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Stephens-Adamson Mfg. Co.
Williams Patent Crusher & Pulverizer Co.

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Lewistown Foundry & Machine Co.

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Hardinge Co.
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Iowa Mfg. Co.
Lewistown Fdy. & Mach. Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
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Universal Road Machy. Co.

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Jackson & Church Co.
McGann Mfg. Co., Inc.

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Stephens-Adamson Mfg. Co.

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Blaw-Knox Co.

Kettles (Calcining)
Ehrsam & Sons Mfg. Co., J. B.

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Blaw-Knox Co.
Hardinge Co.
McGann Mfg. Co., Inc.
Traylor Eng. & Mfg. Co.

Kilns (Vertical)
Blaw-Knox Co.
Hardinge Co.
McGann Mfg. Co., Inc.

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Chicago Steel Foundry Co.

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Hardinge Co.
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Hardinge Co.
McGann Mfg. Co.

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Jeffrey Mfg. Co.
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Stephens-Adamson Mfg. Co.

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Mid-West Locomotive Works
Plymouth Locomotive Works

Locomotives (Diesel-Electric)
Fate-Root-Heath Co.
Mid-West Locomotive Works
Plymouth Locomotive Works

Locomotives (Gas-Electric)
Fate-Root-Heath Co.
Mid-West Locomotive Works
Plymouth Locomotive Works

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Norbom Engineering Co.
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Kansas City Hay Press Co.
Norbom Engineering Co.
Novo Engine Co.
Swaby Mfg. Co.

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Link-Belt Co.
Smith Engineering Works
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Iowa Mfg. Co.
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Productive Equipment Corp.
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Smith Engineering Works
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
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Universal Road Machinery Co.
Universal Vibrating Screen Co.

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Deister Machine Co.
Gay Co., Inc. Rubert M.
Gifford-Wood Co.
Iowa Mfg. Co.
Lewistown Foundry & Machinery Co.
Link-Belt Co.
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Stephens-Adamson Mfg. Co.
Universal Vibrating Screen Co.
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Jones and Laughlin Warehouses

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Harnischfeger Corp.
Industrial Brownhoist Corp.
Link-Belt Co.
Orton Crane and Shovel Co.

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Street Bros. Machine Works, Inc.
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Stephens-Adamson Mfg. Co.

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Jeffrey Mfg. Co.
Link-Belt Co.
Stephens-Adamson Mfg. Co.

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Jones and Laughlin Warehouses

Steel (Structural Shapes)
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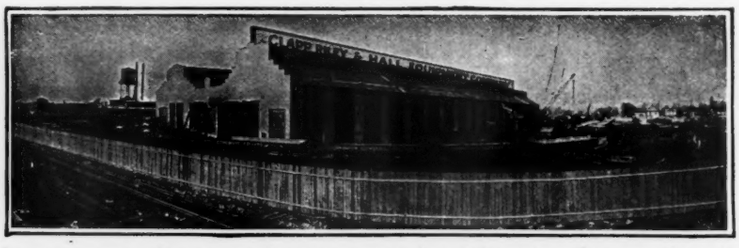

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50—4 & 5-yd., 36″ ga. Dump Cars, new 1926.
1—9x14, 36″ ga. VULCAN, 15-ton Saddle Tank Loco., ASME & NAT. BD BOILER, 170 lbs.
10—Gas Locomotives, 36″ and std. ga. 4 to 25 tons.

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14—Continental 5-yd., 36-in. Gauge, 2-way Dump.
14—Koppel, 36-in. ga. double truck flat cars, 14 ft. 6 in. long by 4 ft. 4 in. wide.
42—Koppel and Lakewood 1½-yd. capacity 24" gauge V-shape dump cars.
12—Koppel 2-yd. capacity, 42" gauge, one way dump, clay cars.

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1—Austin No. 5, gasoline, with 36-ft. boom, on full crawlers.
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24—Gasoline Locomotives as follows: 4—Plymouth 14-ton, 36-in. gauge; 3—Plymouth 8-ton, 36-in. gauge; 7—Whitcomb 8-ton, 36-in. gauge; gear drive; 1—Whitcomb 7-ton, 36-in. gauge; 1—Plymouth 7-ton, 24-in. gauge Friction Drive; 1—Plymouth 7-ton, 24-in. gauge gear drive; 1—Milwaukee 7-ton, 24-in. gauge; 2—Plymouth 4-ton 24-in. gauge, Friction Drive; 2—Brookville Fordson 2-ton stan. gauge; 1—Brookville Fordson 2-ton 36-in. gauge.

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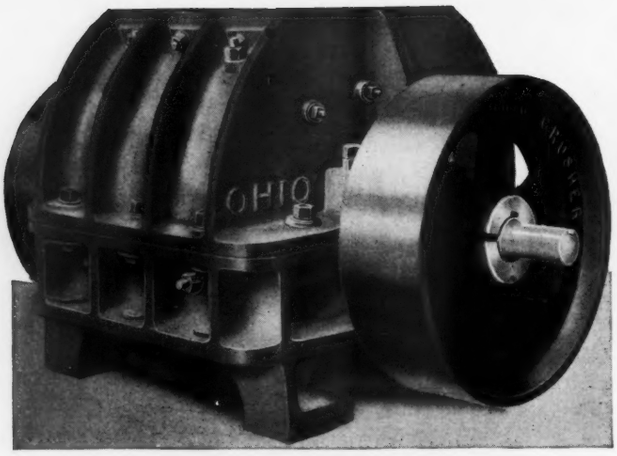

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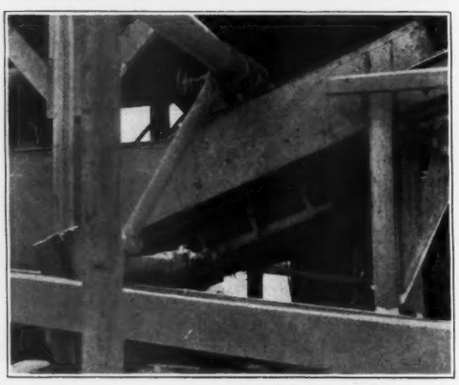

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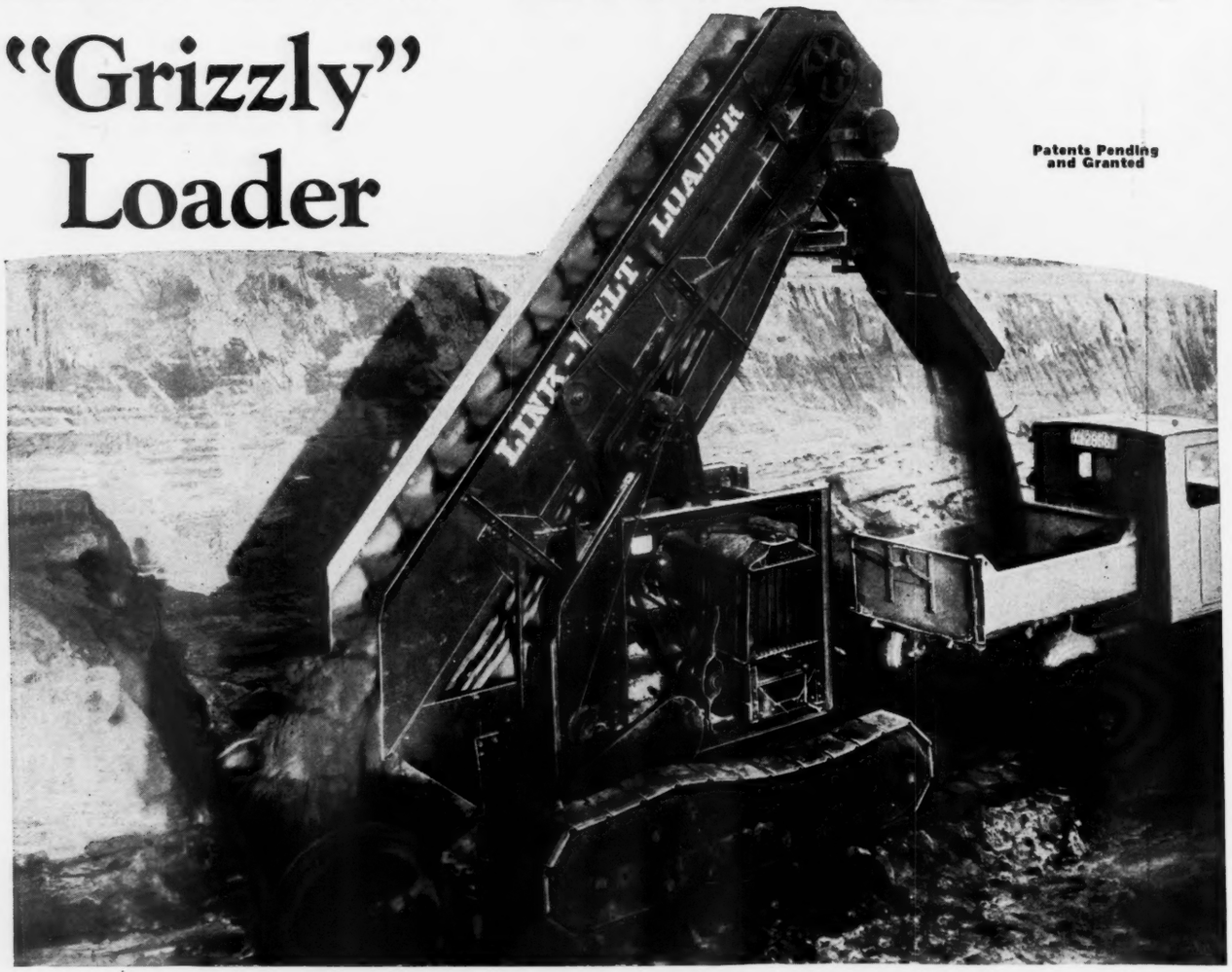

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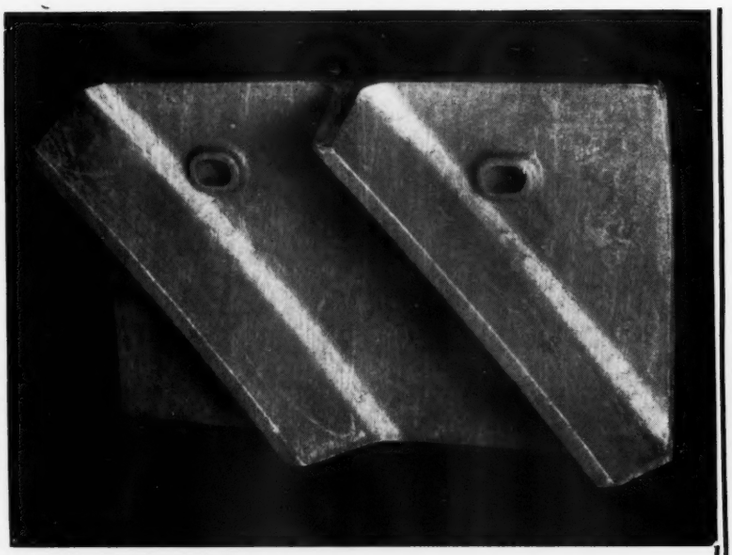

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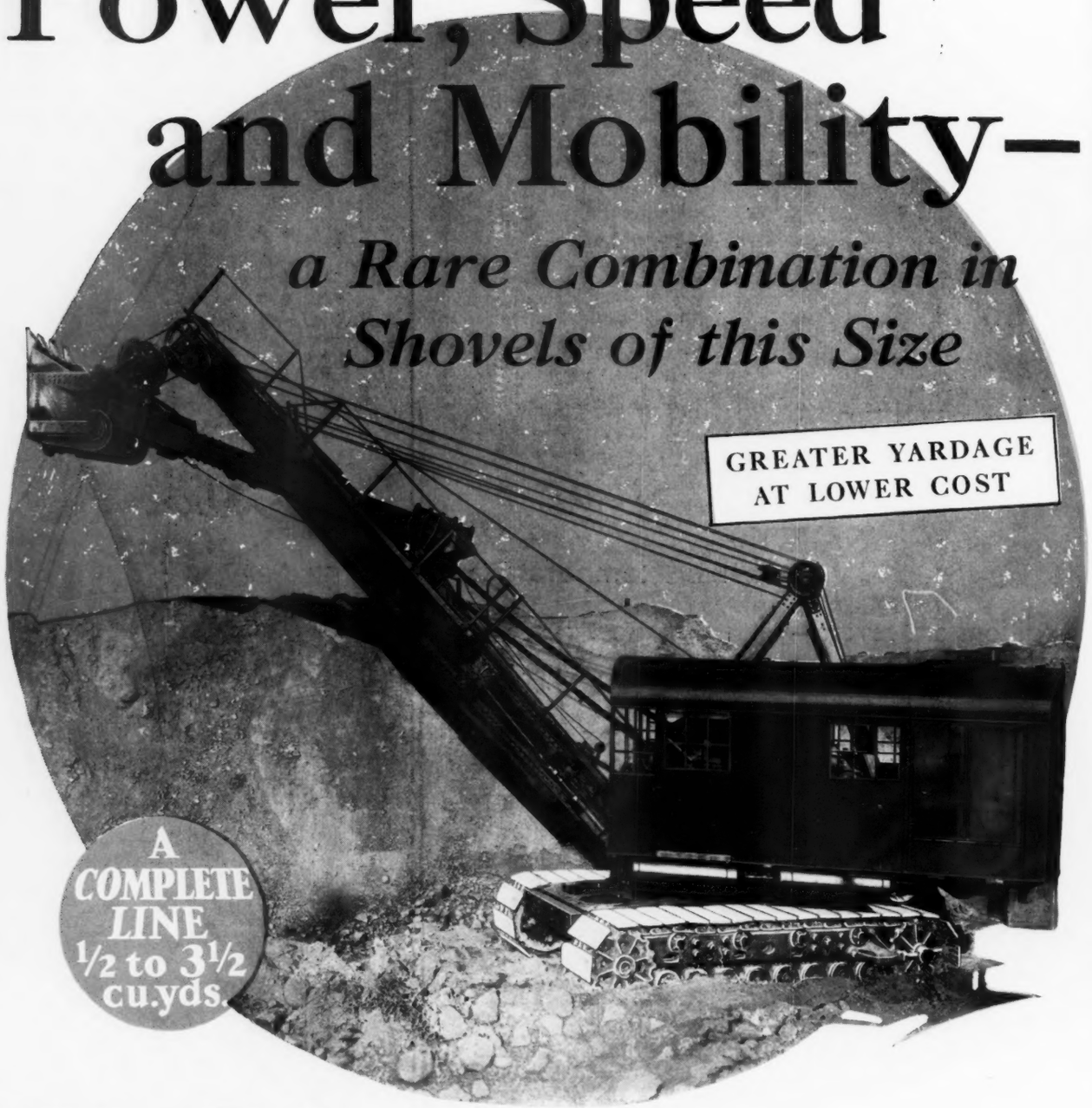

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